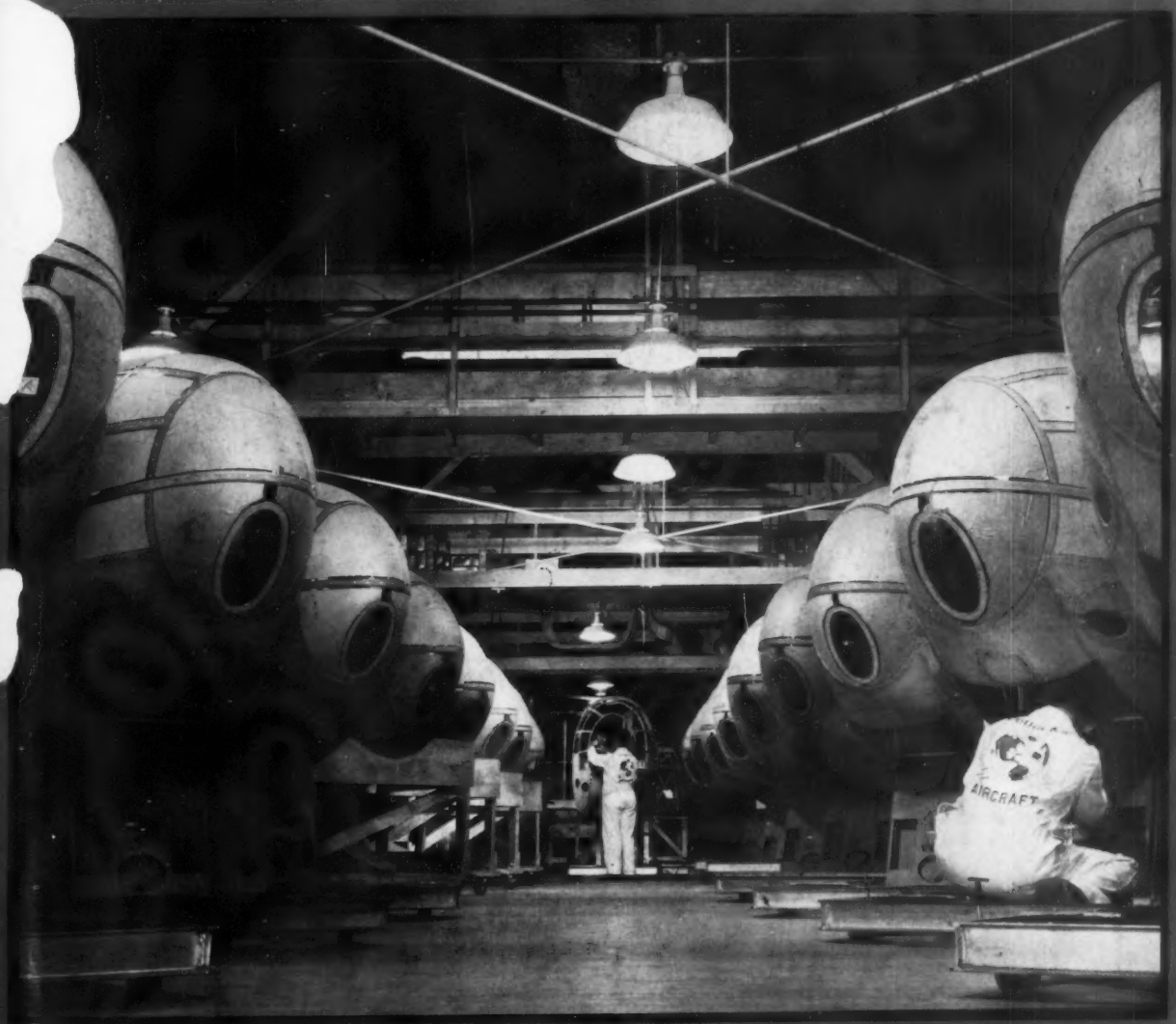
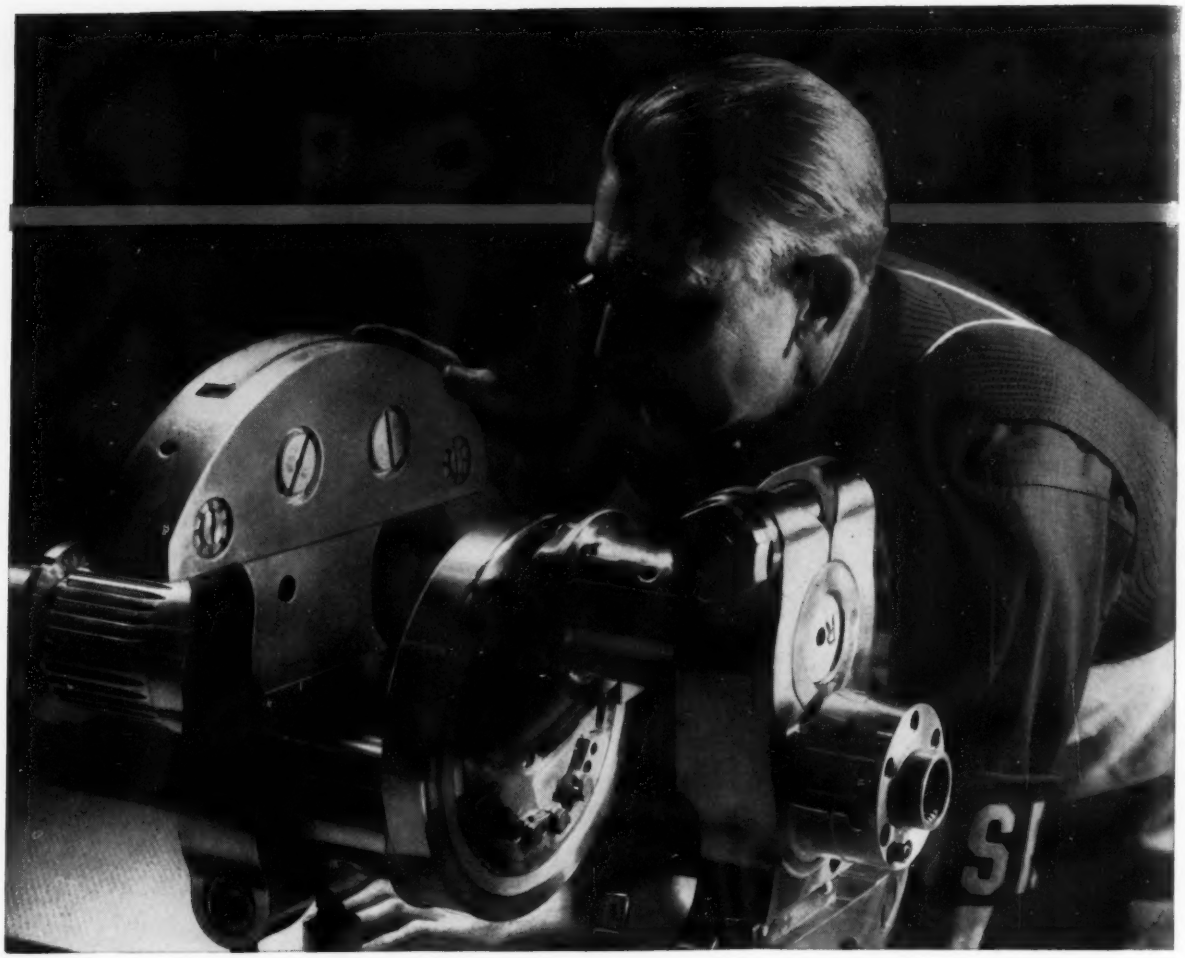
JOURNAL OF THE AERONAUTICAL SCIENCES

AERONAUTICAL REVIEW SECTION



VOLUME 8 APRIL, 1941 NUMBER 6



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AERONAUTICAL REVIEW SECTION

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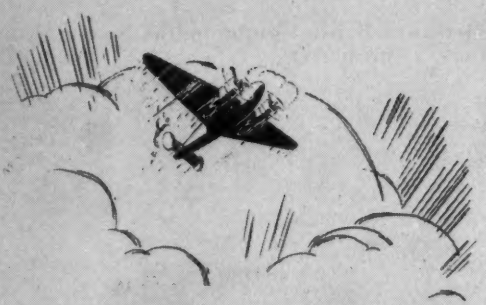

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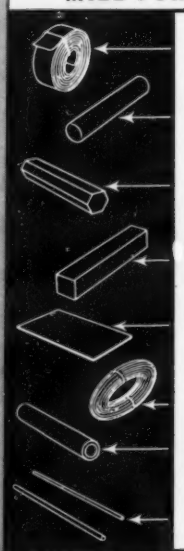

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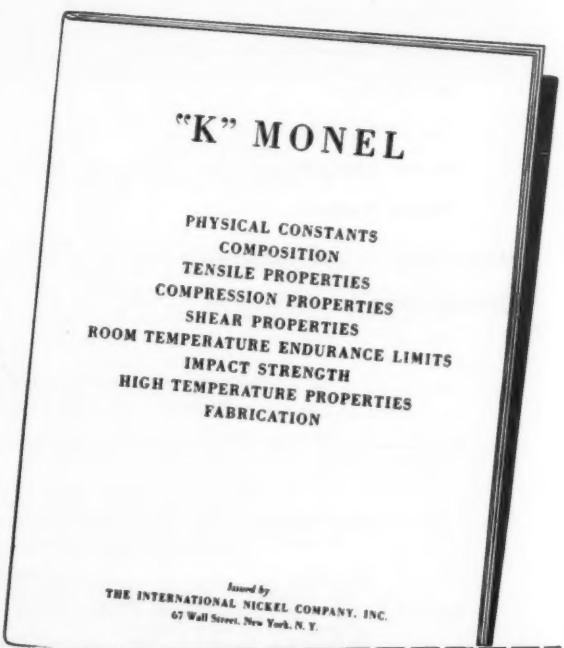

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Restrictions

ENQUIRIES HAVE BEEN received as to the apparent absence in the Aeronautical Review of more reviews of articles in foreign language aeronautical publications and the absence of digests of certain technical papers which have been available in the past.

As to the former question the answer though obvious is not quite simple. The practically complete stoppage of the mails from Germany, Italy and France and other European countries, of course, is the principal reason but even though this obstacle were overcome other factors would be encountered. The shortage of paper, censorship of any information which might conceivably be of assistance to an enemy, and the destruction of printing plants also have had their influence. But in addition to these difficulties there is the more important fact that during wartime all engineers are so actively engaged that they do not have time to do research work that can be discussed in print nor to write articles.

In the United States, the withdrawal from the public of some of the N.A.C.A. regular reports and the limitations placed on writers of technical papers, should be known. As a specific instance, two papers presented at the annual meeting of the Institute of the Aeronautical Sciences had to be withheld from publication because they contained information, which, while proper to read at a meeting, contained confidential material that could not be published.

Notwithstanding the handicaps imposed by present conditions, the Aeronautical Review will make every effort to keep its readers informed as to where they may find articles which may be of special interest to them.

Technical Sales Data

Catalogues are, with the exception of scientific works and fiction, the oldest kind of aeronautical literature. Long before the industry had enough people interested in it to merit periodicals of its own or need house organs, catalogues were in use, mirroring fond hopes that someone might actually want to *BUY* an airplane.

The early airplane builder's library contained more commercial catalogues than books on aerodynamics. His search was for equipment and materials from other industries which might be adapted to airplane building.

During the years that followed the first World War, catalogues on specialized aircraft parts came into being because dealers in war surplus stock had few other means of telling barnstormers, builders and early operators what they had in stock. In order to have their literature preserved, retained and used, additional information was added to the catalogue, such as specifications and suggested adaptations for the equipment offered. Since that day, catalogues in aviation have multiplied in numbers and usefulness, and have developed into engineering and maintenance aids. We reach for the catalogue on a particular product, taking for granted that almost any information we want on the subject will be there, ready for instant use. From a simple list of products and prices, these publications have in many cases, expanded into important and useful compilations of technical data.

For that reason, the Editors of the Aeronautical Review keep a close watch on commercial literature, not only from the industry itself but from outside organizations whose products may be useful to aviation. Pertinent items are reviewed in our House Organs and Catalogues section.

On All Sides

Conflicting opinions about aviation are sincerely and strongly held and often vigorously expressed, because this, like every swiftly moving and important industry, inevitably interests able men of widely different viewpoints. It is through such men and such arguments, in fact, that progress is made. Dissension and disagreement, therefore, are signs of tremendous vitality.

It is only in truthful reflection that these pages portray such controversies when they appear in current books and periodicals. It should be clearly understood that such portrayal is in the interest of aeronautics as a whole, and not in advocacy of any given cause. Reviews herein are impartial. They reflect the original without approving or disapproving, hold a reducing mirror, not a brush, and present a much smaller but un-retouched picture. To do otherwise would be to fail in rendering an essential and already keenly appreciated service.

The Paul Kollsman Library

of the

Institute of the Aeronautical Sciences

A lending library service of the Institute which makes available, without charge, the latest and more important aeronautical books to members of the Institute and others interested in aeronautical progress.

Membership in the library is open to all members of the Institute of the Aeronautical Sciences and to any person in the United States over 18 years of age who can furnish references which certify as to his responsibility and reliability.

The Aeronautical Reader's Guide

A catalogue of selected aeronautical books available for loan from The Paul Kollsman Library. The Guide lists and comments on books and by indexing them under specialized headings also acts as a valuable reference source for aeronautical specialists, companies, libraries and other organizations.

The Guide is issued quarterly in September, December, March and June, and is priced at $1 for the four issues in each volume. Single copies are not available and subscriptions may only be accepted for complete volumes.

Further information will be sent on request.

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News Review

February 11. The House Appropriations Committee recommended that Congress reject the Post Office's request for the $1,299,736 subsidy for the American Export Airlines transatlantic airmail service.

February 11. C.A.B. approves new Lisbon, Bolama, Port-of-Spain, San Juan route for transatlantic Clipper service.

February 13. A bill was introduced to both Houses of Congress for the appropriation of $500,000 for glider training in high schools and colleges.

February 14. Canada's Air Minister, C. G. Power, announced that a chain of airports in Alberta and British Columbia is being established. This move will make an air base link between the U.S. and Alaska.

February 16. Air Express shipments exceed one million for 1940, Air Express Division of The Railway Express Agency announced. This indicates a 23.81 per cent increase over the previous year.

February 16. The Chrysler Corporation announced that it is developing a 2,000 hp. liquid-cooled aircraft engine.

February 17. The $13,000,000 Kaneohe Naval Air Station near Honolulu was opened four months ahead of schedule.

February 17. A plan whereby passengers could pay for air travel in monthly installments was announced by the Air Traffic Conference of America.

February 20. Milo Burcham, Lockheed test pilot, sets new horizontal speed record with a Lockheed P-38. The exact speed reached has not been announced.

February 20. R.A.F. pilots begin training on TWA Stratoliners.

February 21. U.S. Army Air Corps announced that it was reinforcing Hawaii air strength as Far Eastern situation becomes more serious.

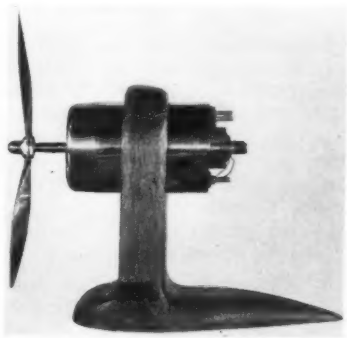
February 22. Navy Department awarded a $9,150,000 contract for the new air base at Hamilton, Bermuda.

February 24. Airways Atlantic Ltd., British transatlantic air line announced that service between England and the U.S. would be resumed this Spring.

February 24. Secretary of War Stimson advised the Senate Foreign Relations Committee that the U.S. Army Air Corps has about 4,000 airplanes in service, half of which are tactical craft.

February 26. The Air Transport Association announced that traffic in January showed a gain of 25 per cent for the same period in 1940 despite heavy cancellations due to weather.

February 27. The Argentine government, which usually purchased military airplanes in Germany or Italy, sought to place an order for military aircraft in the United States.



An electrical wind tunnel motor for "power on" tests which develops ten hp. at 1,800 r.p.m. recently presented to the Aeronautical Archives of the Institute by the Sawyer Electrical Mfg. Co.

February 28. Navy Department announced that a $2,000,000 aircraft plant would be built near Johnsville, Pa., to be operated by Brewster Aeronautical Corp.

February 28. Secretary of War, Henry L. Stimson, announced that six U.S. Army Air Corps units are being sent to strategic air bases in Alaska.

March 2. Nelson A. Rockefeller, Coordinator of Commercial and Cultural relations between the American Republics, left New York on a 28,000 mile air tour of the Americas. J. M. Farris, Eastern Air Lines, acted as pilot; Alfredo de los Rios, aviation writer, as copilot. Major General Frank R. McCoy, President of the Foreign Policy Association, is accompanying the flight.

March 2. Eastern Air Lines established a new speed record for commercial aircraft between New York and Miami. Aided by heavy tail winds, Captain Glenn J. McDonald completed the 1,233 mile flight in five hours and two minutes.

March 2. U.S. Flag raised over Tucker's and Morgan's Islands, Bermuda, as air base sites are turned over to the Navy.

March 5. Aircraft exports from the United States, now the principal item in foreign sales, reaches $40,900,000 for January, an all-time high for this commodity. This is $8,800,000 over the December figure.

March 6. Goodyear Aircraft Corporation, subsidiary of Goodyear Tire and Rubber Company, announced the construction of a plant for the manufacture of parts and sub-assemblies for Glenn L. Martin. Structures from the new plant and engines built by the Chrysler Corporation will be assembled by Martin at Omaha, Neb.

March 7. Rep. Hamilton Fish, of New York, announced that he would introduce a bill authorizing the Secretary of State and the C.A.B. to negotitate for the purchase of Axis controlled air lines in Venezuela, Columbia and Paraguay as a hemisphere defense measure.

March 7. Representative Randolph and Senator Clark introduced a bill for a department of National Defense in which air, sea and land forces have equal rank.

March 8. Henry Ford explains his refusal last Summer to build 9,000 Rolls Royce aircraft engines. He stated that he preferred to build a Ford designed engine capable of producing between 1,500 and 1,700 hp. The proposed power plant would be a 12-cylinder liquid-cooled unit, with a fuel injection system and an exhaust driven supercharger.

March 8. Seattle tries the first trial air raid blackout in the U.S.

March 9. C.A.P. announced that 4,813 C.P.T.P. secondary students had been accepted into the Army and Navy air services.

March 10. Henry Ford announced that his company had been experimenting with light airplanes for ultimate mass production.

From the Industry

Civil Aeronautics Administration

Six rated flight instructors, the first contingent of a group which will ultimately total more than 200, recently began the C.A.A.'s Cross Country Instructor Course at the pilot training school conducted by Northeast Airlines, Inc., at Boston, according to Charles I. Stanton, Assistant Administrator of Civil Aeronautics.

The same course will be initiated at the Boeing School of Aeronautics, at Oakland, California.

Successful completion of this course which will cover a two weeks' period and consist of both ground instruction and actual flight instruction will qualify those taking it to serve as instructors in the Cross Country Flying Course, a new phase of the Civilian Pilot Training Program, which will be inaugurated late this spring.

Flight instructors being designated to receive training at Boston and Oakland are from the instruction staffs of the approved secondary flying schools. These men must not only hold certificates of commercial grade and instructors ratings, but also the third class radio telephone operators license issued by the F.C.C., which all pilots must have to carry on two-way radio communication while in flight.

Under the plan for training Cross Country Instructors, men will report to the two training centers in units of six or nine each week for the next 16 weeks.

Amendments to the Civil Air Regulations have been approved, changing those sections concerning the tests of aeronautical skill required for the various types of certificates.

Prior to the passage of these amendments an applicant for a pilot certificate was required to demonstrate his ability to make spot landings, after the execution of a 360-degree turn from 1,500 feet and a spiralling approach from 2,000 feet. A recent study by the Board's Safety Bureau has shown that within the past year serious collision accidents have occurred between training planes engaged in the practice of these maneuvers and other aircraft. The Board's action in adopting these amendments removes these particular requirements and provides instead that the applicant be required to demonstrate three (instead of one) spot landings from a normal 180-degree approach turn and that, independent of any landing maneuver, he demonstrate his ability to spiral.

Minor reforms have also been made in the regulations governing skill in recovering from stalls.

Releases are printed as received from companies and other aeronautical organizations and the responsibility for the accuracy of all statements is therefore not assumed by the Aeronautical Review.

The Civil Aeronautics Board has passed an amendment to the Civil Air Regulations requiring all scheduled aircraft over 10,000 pounds gross weight to be equipped by January 1, 1942, with a device which will make a record of the altitudes at which the airplane is flown, as well as show the time and period of operation of the radio transmitter during flight.

This recording device, among other uses, will serve to furnish valuable operating information to the air lines, substantiate a pilot's report of his flight and can be used to settle any controversies which may arise as a result of reported violations.

Robert H. Hinckley, Assistant Secretary of Commerce, announced that 4,813 graduates of the C.A.A.'s Civilian Pilot Training Program had volunteered and been accepted by the Army and Navy air services as of March 1st. Mr. Hinckley added that as of that date 914 flight instructors trained in the Program had been "fed" to other aviation activities.

Mr. Hinckley stated that the figure 4,813 represents more than 11 per cent of the students who have completed the C.P.T. preliminary training and approximately one-fourth of the total number trained in the secondary phase of the Civilian Pilot Training Program.

These statistics were compiled by C.A.A. officials in a canvass of the 907 centers participating in the Program and include only those men now actually in Army or Navy training and those who have been accepted by the military forces and are under orders.

"They are impressive figures when one considers that the great majority of the boys who have taken the Civilian Pilot Training are still in college completing their studies," said Mr. Hinckley. "These boys are not available to the armed forces, as a matter of national policy, unless they choose to volunteer. They are deferred until the end of the school year in the draft.

"Yet this remarkable number of volunteers simply confirms our belief that as we build up the backlog of pilot material, more and more of our trainees will flow into the air services.

"The Army's figures on cadets who started their primary stage in the January class showed that about one out of five were C.P.T. trainees."

Almost as important as the student pilots, Mr. Hinckley said, are the 941 flight instructors, trained in the C.A.A. program, who have left it to supply trained manpower to a variety of defense efforts.

The largest group of instructors—468—have gone to give flight instruction in the Army's primary civilian training centers. These virtually have staffed the Army's expansion of this type of school, he pointed out.

Twenty-seven other instructors have gone to teach Naval aviation, and 117 to teach in Canadian flight centers. Ninety-six have gone to active duty with the Army, 26 with the Navy, and 207 have gone to the air lines to train as replacements of older co-pilot personnel.

"Despite the fact that our instructors are leaving in such large numbers there will be no shortage," said Mr. Hinckley, "as we are constantly training others to take their places. We are building up a reservoir on which the armed forces and the air lines can continue to draw for trained personnel."

To date, 37,277 pilots have successfully completed the C.P.T. student courses, 3,911 of them in the secondary phase. A total of 2,063 instructors have been given refresher courses.

Air Transport Association of America

Col. Edgar S. Gorrell, President of the Air Transport Association of America, announced the formation of a corporation to survey the possibilities of engaging in the business of transporting freight and express by air.

"The new corporation, to be called Air Cargo, Inc.," Col. Gorrell said, "is wholly owned by four of the domestic airlines—American Airlines, Eastern Air Lines, Transcontinental & Western Air, and United Air Lines. The plans for the formation of the corporation have for some time been discussed with all of the air lines and it is contemplated that all air lines will participate in its ownership and control as soon as it is found desirable for the new corporation to engage in the air cargo business.

"Within the near future, and certainly upon the termination of the present War, the transportation of property by air will become a far greater industry. Indeed, the essentials of this industry are being created now through the manufacture of huge bombers and the transportation under all weather conditions of tons of bombs.

"The air lines of the United States are intent upon preparing for this next great forward step in the development of civil transportation.

"Accordingly, they are immediately undertaking, through Air Cargo, Inc., a comprehensive study of all means for assuring that this development will take place along the soundest lines for the good of the country.

"The industry is deeply conscious that when the present War is over, civil aviation will have been proved more than ever to be the backlog of national defense, as our great President recognized more than two years ago. Upon this industry will rest the responsibility for assuring that aircraft manufacture can profitably continue unabated, that the skills necessary for the operation and maintenance of great fleets of aircraft will be developed and multiplied.

"An initial expenditure of $100,000 by the four airlines forming the corporation is contemplated. Necessarily there will be an extended period of study. The matter is too important to the future welfare of the nation to jump at conclusions or to commit ourselves to hasty and loosely formulated plans."

National Aviation Training Assn.

A movement to create a Civilian Air Reserve, fostered by the government and under military direction is gaining support from aviation leaders throughout the nation. The plan has been submitted to government departments connected with aviation, and is being studied as a possible emergency auxiliary to the air corps.

The C.A.R. would use the airplanes owned by private fliers in such activities as carrying supplies, air ambulance service, or flying important individuals wherever summoned. Instruction in military air tactics would be given those enlisted, in order that the C.A.R. pilots, when on duty flights, would be able to fit their activity into the need of the moment. The civilian pilots would not be expected to engage in combat service.

The proposed C.A.R. would open opportunity for ground and flying personnel in all divisions of air service. This would include engine and airplane mechanics, radio men, photographers and all other technicians usually connected with military air units.

Boeing Airplane Company

The Stearman Division of Boeing Airplane Company, Wichita, Kansas, this month delivered its 1,000th primary trainer under Army and Navy defense contracts.

A special ceremony at the Wichita plant on March 15th, attended by throngs of Stearman employees and observers, marked the delivery of trainer No. 1000, which went to the Army, and No. 1001, which went to the Navy. Major Ray G. Harris, representing the U.S. Army Air Corps, and Lieut. Commander W. B. Ault, representing the U.S. Navy, accepted the two trainers for the government as they were rolled from the assembly line and onto the field to join several dozen others that stood in line there ready for delivery.

British Press Service

The 220 over-age pilots of Britain's Air Transport Auxiliary, who since last August have been ferrying vitally needed planes from British factories to Royal Air Force Fields throughout the country, have now completed 1,500,000 miles of flying service.

The A.T.A. is a volunteer service and its pilots, including 15 Americans, are drawn from every rank. A few rate paragraphs in "Who's Who," while many are simple farmers and storekeepers. It was founded by Gerard d'Erlanger. One of the live-wires in Britain's aviation industry, Mr. d'Erlanger early realized that road and rail transport in Britain might be disrupted as the shadow of the threatened Nazi blitzkrieg turned into reality in the fall of 1940. He foresaw that Britain's life-blood, the continued flow of Spitfires and Hurricanes from assembly-line to pilot, might be sapped.

A pilot himself, though too old for service with the R.A.F., Mr. d'Erlanger and a well-known British Aviation writer, Captain F. D. Bradbrooke, gathered about them an initial group of 40 other pilots also ineligible for the armed forces. Among them are C. S. Napier, engine manufacturer, and Wally Handley, well-known auto racer. Richard Fairey, whose father builds the Fairey-Fulmar planes of the Fleet Air Arm that blasted the Italian fleet into impotency at Taranto, is another of the group.

Among the Americans, there are several who list their vocation as "cotton-dusters," men who fly five or six feet above ground and spray crops with chemicals in various parts of the United States.

Although pilots of the A.T.A. must know how to fly every type of plane, from a heavy Wellington or Sunderland bomber to the tricky new Spitfires and Hurricanes, they wear no regular uniform and have no service rank in the R.A.F. Frequently they must make deliveries through skies thick with enemy aircraft, but they fly their machines without guns or bombs.

Douglas Aircraft Company

America's giant of the sky is standing on its own feet, and soon will take wing.

This was disclosed by officials of Douglas Aircraft Company, who announced successful installation and checks of the 5-ton landing gear for the huge B-19. Within a few days the company expects to roll out the 82-ton super-bomber for extensive tests before its delivery to United States Army Air Corps.

Design and construction of the landing gear, by far the largest ever built, involved problems never before encountered, and required special machinery and production equipment of unprecedented size.

Five different types of steel are employed in the retractable tricycle gear. So huge are the various parts that their machining necessitated the building of the world's largest turret lathe, with a working radius of 150 inches.

Solid steel bars weighing approximately 53,000 pounds were forged and machined into two mainlegs and a nose strut with a total finished weight of 4,000 pounds. The two main wheels, each 96 inches in diameter, and the 54-inch nose wheel, themselves weigh an additional 5,800 pounds; the total—9,800 pounds—or more than the weight of a small scout-bomber!

The landing gear and retracting

mechanisms were built by Cleveland Pneumatic Tool Co., and the tires and wheels by Firestone Tire & Rubber Co. and Bendix Aviation.

Of 24-ply construction, each giant tire contains in addition to its rubber and fabric, nearly 150 miles of rayon cord and 3 miles of steel wire.

Each main wheel is carried on an axle forged at right angles to its piston, the axle-piston unit weighing over 500 pounds. Brakes are provided on both the inboard and outboard sides of each of the 36-inch-thick wheel hubs.

The cylinder into which the piston telescopes is about the height of an average man, and is sealed to hold 2,060 cu.in. of compressed air when the strut is fully extended. Under full load this is compressed to 864 lbs. per sq.in. When the huge airplane lands, the load is first taken by the tire and transmitted to the axle and piston, where hydraulic action dissipates the shock. Twenty gallons of oil are sealed in each strut to provide this hydraulic action.

At the manufacturer's plant the gear was completely assembled and tested under loads simulating the actual take-off and landing of an 82-ton airplane. Having installed the equipment on the B-19, Douglas engineers tested the hydraulic retracting mechanisms and made minor adjustments.

Upon delivery to the Army Air Corps, the B-19 will become a flying laboratory for defense, and serve as the foremost aerial guardian of our hemisphere.

The Glenn L. Martin Company

The Army's bombardment squadrons are taking deliveries on their new Martin B-26 medium bombers. Having passed their Army tests, the ships are already rolling off The Glenn L. Martin Company's assembly lines at Middle River and onto the company's private airport.

Rated the most powerful airplane of its class, both on offensive and defensive, the 13-ton B-26 will be one of the most prolific production types under the National Defense Program. It carries a bomb load nearly twice that of similar types. It boasts unequalled defensive power, including a power-operated turret, tail and nose turrets and other gun positions which cover every angle of fire. And it travels at a speed faster than most of Europe's pursuit airplanes.

This latest Martin bomber has set interesting production records already. It had no prototype; the test ship was actually a production model, and before the Wright Field pilots had finished with their trials, the final assembly floor of the military building was filled with B-26's.

Aircraft radios being assembled in the production department of the Lear Avia plant at Dayton, Ohio.

Röhm & Haas Company

To speed service to aircraft companies on the West Coast, the Röhm & Haas Company of Philadelphia is building a branch plant in the Los Angeles area, scheduled to begin operation May 1st. The new building will be devoted primarily to national defense work in the fabrication of Plexiglas sheets into cockpit enclosures, observation turrets and similar transparent plastic parts for military planes.

Röhm & Haas developed Plexiglas in 1935 after pioneering research in the field of acrylic resin plastics begun in 1901. At moderate temperatures Plexiglas is formed into curved transparent sections—machine gun "blisters," navigators' hatches and bombers' windows—which give crew of today's fighting planes the advantage of all-round visibility.

Transcontinental and Western Air, Inc.

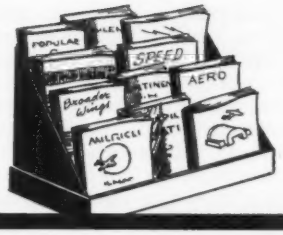
Long-range bombers operating with little fear of attack seven miles above the earth may be expected to appear in the theater of military combat "before this war is over," according to a paper by D. W. Tomlinson, well-known high altitude flyer, read before the Southern California section of the Society of Automotive Engineers here.

Tomlinson, Vice-President in charge of engineering for Transcontinental & Western Air, Inc., and a commander in the U.S. Naval Reserves, said these bombers would easily outstrip pursuit planes in the rarified air of 30,000 to 40,000-foot levels and be virtually free to deliver sledgehammer blows in daylight raids. Daylight operations at present normal levels of 15,000 to 20,000 feet largely have failed in the present war because of "grave losses" inflicted by pursuits, Tomlinson said.

"We will probably hear in the near future of four-engine long-range day bombers with supercharged cabins operating between 30,000 and 40,000 feet," said the flyer who pioneered the development of TWA's 4-engine, 33-passenger Stratoliners. "The adaptation of pressurized cabins to such aircraft is not too difficult. Only the portion of the fuselage containing the bombardier, flight crew and adjacent rest space for the remainder of the crew need be pressurized. This calls for pressurizing the nose of the airplane, which is relatively safe from effects of machine gun fire. An air lock must be incorporated so that in emergency, gun crews may move out of the pressurized section to man their guns in the aft portion of the fuselage. Oxygen must be available at the gunners' battle stations.

"Bombing aircraft flying at these great altitudes, possess distinctive advantages. It is extremely difficult to sight aircraft during perfectly clear weather when flying above 30,000 feet. Interception at these levels will be very difficult, and having accomplished the interception, the pursuits will be virtually impotent unless they incorporate pressurized provisions for the pilot, and pressurizing of the cockpit of a fighter is a terrific problem which will handicap the performance of the pursuit plane to a much greater extent than does the pressurizing of the large bomber. Being able to fly above 98 per cent of all clouds will give the bomber crews the advantage of being able to navigate

(Continued on page 43)



Periodicals

The reviews in these pages reflect the statements and opinions of the authors of the articles reviewed, and are not to be taken as editorial expressions of the Aeronautical Review.

Aerodynamics

Why a Rear Engine Installation—Part 1. Robert J. Woods. The chief design engineer of Bell Aircraft Corp. tells of how this important step was taken in the design of the Airacuda and Airacobra. Part 1 outlines the history of streamlining engine installations to reduce drag, together with the more recent problems of gun installations in high speed military aircraft. Steps taken at Bell Aircraft to solve these problems will be described in a later article. *Aviation*, March 1941, pages 36, 37, 142, 8 illus.

Sul Problema del Moto Discontinuo di un'Ala (On the Problem of Non-Uniform Motion of a Wing). C. Possio. A method of examining non-uniform motion is explained, as indicated in a previous study, but in a less complete form, showing it to be identical with Wagner's method as recently discussed by Kármán and Sears. Therefore this method may be applied to the study of the problem of the improvised rotation of a finite airfoil in a uniform flow, or of an infinite airfoil in a vertical gust. *Pubblicazioni del Laboratorio di Aeronautica*, No. 141, September 1940, 27 pages, 6 illus.

Load Factors in Gusts. Digest of a report dealing with gust acceleration loads issued by the Civil Aeronautics Board. Included is an explanation of the effects of gusts on airplanes at a given speed and wing loading. Also shown and explained is the V-G recorder which measures and records load factors of gust acceleration and dive pull-outs. *Flight*, February 6, 1941, pages 11, 112, 2 illus.

Il Problema dell'Elica con Vento Laterale (The Problem of a Propeller in Cross Wind). C. Ferrari. The author shows how to determine axial and normal increase of speed produced by a propeller, the axis of which forms any angle whatever with the asymptotic current, and so to determine the aerodynamic characteristics of this propeller, according to Prof. Pistolesi's theory of "mean increase." *Pubblicazioni del Laboratorio di Aeronautica*, No. 135, April 1940, 31 pages, 7 illus.

From the Wind Tunnels of Langley. Detailed account of the aeronautical research and test activities of the National Advisory Committee for Aeronautics in its Langley Field, Virginia, laboratories. Some of the many contributions made by the N.A.C.A. to aeronautics in the past few years are described, including recent work on its laminar flow airfoil, research into super-sonic airflow and resultant shock waves, as well as "cleaning up" prototypes of some of our newer military aircraft. History and background of this important government agency, devoted to aeronautical research, is outlined from its establishment in 1915. Its organization, from the members of the Committee who serve without pay, to the 873 paid employees headed by Dr. George W. Lewis, director of aeronautical research since 1919, is described. In emphasizing the importance of the N.A.C.A. to American aviation and national defense, the writer quotes T. P. Wright's recent article in *Aviation*. "Unfortunately we can never have tomorrow's airplane today, or even today's best design, today, in service squadrons. This rapidly advancing art makes it necessary always to fight with semi-obsolete equipment. This indicates the tremendous importance of continuing research and development even in wartime, so as to approximate the ideal, or at least surpass the enemy, in planes doing the actual fighting." *Fortune*, March 1941, pages 106–113, 142–146, 21 illus.

Further Development of a Boundary Layer Profile for a Given Pressure Distribution. H. Gortler. Continuation of Prandtl's work "On the Calculation of Boundary Layers," dealing with the problem of developing in detail the method for continuing a given velocity profile in a laminar boundary layer when the pressure distribution is given. The method is tried out in practice in a calculated numerical example. *The Journal of the Royal Aeronautical Society*, February 1941, pages 35–50, 10 illus.

How Fast Can We Fly? Outline of some of the problems of high speed airplanes and flight, including some of the experiences of Lockheed's chief test pilot, Marshall Headle, in test

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flying the Lockheed P-38. Other experiments on high speed research at Lockheed are mentioned. *Popular Mechanics*, March 1941, pages 321–323, 154A, 157A, 159A, 7 illus.

Calcolo delle Caratteristiche di Volo per Velivolo con Eliche a Passo Variabile Regolate a Numero di Giri Costante (Calculation of the Flight Characteristics of an Airplane with a Constant-Speed Variable-Pitch Propeller). E. Lorenzelli. By calculating two contingent coefficients (A and B), the characteristics of the power required, the maximum speed and rate of climb of an airplane with a constant-speed variable-pitch propeller may be determined, combined in a single diagram. In a similar manner by calculating the two coefficients α and β, the characteristics of the cruising range (at constant cruising speed, or constant aerodynamic efficiency) may be determined. *Pubblicazioni del Laboratorio di Aeronautica*, No. 140, July 1940, 26 pages, 8 illus.

Accessories

Carburetor and Propeller Anti-Icers. David Gregg. Details and description of an anti-icer pump. Uses, problems of design, construction and control are outlined. *Aviation*, March 1941, pages 42, 43, 130, 131, 5 illus.

Aircraft Accessories Offer Easy Starting. Assen Jordanoff. One in a series of articles taken from "Your Wings." This one deals with engine starters, and explains both inertia and direct cranking electric starters. The inimitable Jordanoff drawings are based upon various Eclipse starters. *Canadian Aviation*, February 1941, pages 59, 61, 10 illus.

Landing Lights. History, background, and developments story of Harley landing lights. M. C. Harley rigged his first landing light on his D. H. Moth so that he could land after dark. From this beginning he has developed a complete line of landing lights and ground lighting equipment. Several types are shown, both for airplanes and airports. *The Aeroplane*, February 7, 1941, pages 179–181, 7 illus.

Airplane Descriptions

New American Bomber. A description of the Martin B-26 medium bomber, powered by two 1,850-hp. Pratt and Whitney engines and equipped with four-bladed propellers with cuffs. *Flight*, January 23, 1941, pages c, d, 3 illus.

The Stinson Voyager. Details of equipment, performance and specifications of a new 90-hp. three-place airplane for the private owner. The Voyager is the 1941 version of the Stinson 105, and comes equipped with electric starter and generator, hydraulic brakes, flaps and built-in slots, dual wheel controls, with the interior done in two-tone broadcloth. Top speed is 115 m.p.h. and the rate of climb has been increased to 600 ft. per min. *Aviation*, March 1941, page 68, 3 illus. *The Sportsman Pilot*, February 15, 1941, pages 22, 23, 5 illus. *Aero Digest*, March 1941, pages 243, 244, 4 illus.

Northrop Patrol Bomber. A description of the Northrop N-3 twin-float three-place patrol bomber, powered by one 1,200-hp. Wright Cyclone engine. This type airplane was especially designed and built for the exiled Norwegian government. *Aero Digest*, March 1941, pages 250, 252, 6 illus.

Latest Airplanes of the U.S. Army and Navy Air Service. A photographic survey of the latest type military airplanes, whose performance and constructional data has not as yet been released by the War and Navy departments. *Aero Digest*, March 1941, pages 190, 192, 194, 29 illus.

Private and Commercial Aircraft. Specifications, performance data, power plant description, construction details, equipment and instruments on sixty-four types of approved commercial aircraft manufactured in the United States. Three-view drawings and a photograph of each are included. *Aero Digest*, March 1941, even numbered pages from 130–162, 128 illus.

Military Aircraft. Specifications, performance, power, construction and accessory data on fifty-two types of military aircraft being manufactured in the United States. Three-view drawings and photographs are also provided. *Aero Digest*. March 1941, even pages from 162–190, 104 illus.

Private and Commercial Aircraft without ATCs. A picture survey of twenty types of experimental aircraft being built and studied in the United States. *Aero Digest*, pages 198, 200, 20 illus.

Curtiss-Wright 21-B Interceptor-Fighter. Detailed description of the Curtiss-Wright interceptor with a rate-of-climb equal to 60 m.p.h. vertically. Powered by a 1,000-hp. Wright Cyclone with a two-speed supercharger, its maximum speed at 18,000 feet is 333 m.p.h. Armament consists of two .30 and two .50 caliber machine guns mounted in the fuselage with provisions for additional pairs of .30 and .50 caliber guns in the wings. Construction, equipment, controls, performance, and many other details are given. *Commercial Aviation*, February 1941, 29, 30, 34, 35, 3 illus.

Notes on the Evolution of Two First Line Aircraft. G. H. Outline of the development of the Spitfire and Hurricane fighters. The Supermarine Spitfire evolved from the Supermarine S.4, S.5, and S.6 Schneider Trophy racers which set several world speed records for seaplanes from 1925 to 1931. The Hawker Hurricane was developed from the earlier Hawker biplane fighters, the Fury and the Super-Fury or Mark II. Earlier types from which both of England's first line fighters are descended, are shown and described. Of especial interest are plan views superimposed showing similarity in design. *Aeronautics*, February 1941, pages 26–31, 20 illus.

Newly Designed Piper Coupe. Details of some of the improvements and new equipment of the 1941 Piper Coupe. The interior has been redesigned, horsepower stepped up to 75, and a new type of engine starter has been added as standard equipment. Its mechanism is activated by a shock-cord attached to the tail post. It is stretched by winding, done by a lever from the cabin. When released it enables the starter to give the engine a two-revolution turn. Radio, battery and navigation lights are also standard equipment. *Aviation*, March 1941, page 64, 5 illus. *The Sportsman Pilot*, February 15, 1941, pages, 22, 23, 5 illus.

The Sportsman Test Pilot. James B. Taylor, Jr. Description of the Ranger-powered and Warner-powered Fairchild M-62 trainer. Flying characteristics are described as ideal, and the writer voices preference for the model with enclosed cockpits. Other details of design and performance are also given. *The Sportsman Pilot*, February 15, 1941, pages 12, 13, 41, 4 illus.

The Mitsubishi MC-20 Japanese Transport. Paul H. Wilkinson. Specifications and performance data on one of the latest Japanese commercial transport airplanes. It is an all-metal twin-engined, low-wing monoplane combining features of Douglas, Boeing and Lockheed transport design. Engines are said to be of Japanese design and manufacture. *Aviation*, March 1941, pages 66, 67, 3 illus.

Wally Timm Aero-Craft. Description and details of a new low-wing tandem trainer for secondary C.P.T.P. instruction. Powered with a Kinner R-5 engine of 160 hp., the airplane has a cruising speed of 115 m.p.h., a top speed of 125 m.p.h. and a cruising range of 3.5 hours. Fuselage, tail-group and wing-stubs are of steel

tube construction, fabric covered, while the wings have solid spruce spars and truss spruce ribs with conventional fabric covering. Other dimensions and specifications are given. *Aviation*, March 1941, page 62, 3 illus.

The Lockheed Lodestar. Complete details and specifications of the Lockheed Model 18, Type 17 PCLM, commercial transport. Maximum speed is 276 m.p.h. at 16,700 ft., maximum cruising speed 248 m.p.h. at 19,000 ft. Complete figures are given on take-off and landing requirements, performance, wing and power loading, as well as a list of dimensions. *Flight*, January 16, 1941, pages e, f, 3 illus.

The Blackburn "Botha" I. A description of the Royal Air Force's new twin-engined high-wing general-purpose torpedo bomber, the Blackburn "Botha" I. *Flight*, January 30, 1941, page 99, 1 illus.

Two American Trainers. Description of the Ryan ST-3 and Howard DGA-125 trainers. Details of performance and specifications are listed. *Flight*, February 6, 1941, pages 118–120, 3 illus.

The Martin Marauder. Robert McLarren. History and description of the Martin B-26 attack bomber which is described as the fastest craft in its military class. *Model Airplane News*, March 1941, pages 14, 15, 56, 5 illus.

Meridionali RO. 37 bis. A description of the Italian R37 bis army cooperation biplane built by Industrie Meccaniche Meridionali. This airplane, designed by Nicola Romeo, is powered by a 560-hp. Paggio radial engine. *The Aeroplane*, February 14, 1941, page 200, 5 illus.

To La Quinta Via "Skyranger." Description of a flight from Los Angeles to La Quinta, near Palm Springs, Cal., in a 75-hp. Continental-engined Rearwin "Skyranger." Physical and flying characteristics of the new light airplane are described. *Western Flying*, February 1941, pages 32–34, 46, 4 illus.

The Italian Hold-All. Description and specifications on the Savoia Marchetti S.M.82, low-wing trimotored bomber-transport. Commonly known as the Canguru (Kangaroo), this craft is used as a bomber, freight-carrier, troop transport and long range scout-bomber. *The Aeroplane*, January 31, 1941, pages 142–144, 11 illus.

The Cirrus Taylorcraft. A description of the English version of the Taylorcraft, built under license from the American company. It is powered by a 90-hp. Cirrus Minor engine. *The Aeroplane*, January 31, 1941, page 132, 1 illus.

Outdoor assembly of Consolidated bombers at San Diego, California.

New R.A.F. Types. Description, three-view drawings and dimensions of the Douglas "Boston" (DB-7) and the Brewster "Buffalo" (XF2A-I), both military airplanes supplied by American manufacturers to the R.A.F. *Aircraft Engineering*, January 1941, pages 14–16, 7 illus.

An Analysis of Captured Nazi Warplanes. DeWitt Wendell. British aeronautical engineers, after examining German military airplanes selected from over 3,000 which have been shot down since the war began, released reports on several of the prominent types. Their reports on the Messerschmitt 109 and 110, the Heinkel 111K and the Junkers Ju 88, reveal that the German craft are neither badly built nor lacking in material, as many wishful thinkers reported earlier in the war. The use of rubber is liberal, and there is no evidence of the use of substitutes, except where the "ersatz" is better than the natural material. Examination of the contents of the fuel and lubricant tanks indicate no shortage of high-octane gasoline and high quality oil. The examination of the interiors also reveal an excellent system of maintenance. Detailed descriptions of captured German airplanes and figures on their performance are included. *Flying and Popular Aviation*, March 1941, pages 14–17, 64, 66, 68, 8 illus.

The Savoia Marchetti S.M.81 "Pipistrello" Bomber. Specifications of the S.M.81 three-engined bomber, a military version of an earlier Savoia Marchetti civil transport. It is one of the older Italian military aircraft with a top speed of 211 m.p.h. Details of construction and armament are given. *The Aeroplane*, January 24, 1941, page 120, 5 illus.

New Types. Brief descriptions, photographs and planforms of the new Blackburn Botha I, and the Supermarine Spitfire Mark III. Detachable wing tips of the latter have been removed which lessens wing area and gives it a clipped-wing appearance. Some specifications and performance figures are included, together with descriptive data on the new Hawker Tornado, and the Short Stirling. *The Aeroplane*, January 24, 1941, pages 110, 11, 7 illus.

Airplanes from the United States for Great Britain. Profile drawings, descriptions and performance figures on many of the types of airplanes sent to England by factories in the United States. Aircraft built by the following companies are included in the survey: Bell, Boeing, Brewster, Cessna, Consolidated, Curtiss-Wright, Douglas, Fairchild, Grumman, Lockheed, Glenn L. Martin, North American, Republic, Spartan, Stinson, Vought-Sikorsky, Vultee and Waco. *The Aeroplane*, January 17, 1941, pages 88–96, 51 illus.

The Blackburn Botha. A description of the twin-engined high-wing Blackburn Botha I, the R.A.F.'s new general-purpose torpedo bomber. The new type is powered by two Bristol "Persues" Xa sleeve-valve radial engines. *The Aeroplane*, January 31, 1941, page 145, 2 illus.

Air Policy

Our Airlines and the Politicians. Morris Markey. Facts concerning some of the actions taken by the Air Safety Board during the period when the C.A.A. was an independent group, and the remarkable safety record of not one fatal accident in fifteen months was set by air lines in the United States. The writer believes that the record itself was no accident. The Safety Board made up of Tom Hardin, C. B. Allen, and Sumter Smith of Alabama, took drastic action following several crashes. Licenses were revoked, structural changes were ordered. It was found that if one engine failed on a twin-engined transport the spinning propeller not only ruined the disabled engine but set up vibration which in several instances tore the engine loose

from its mounting, or caused other structural failure. The answer was full feathering propellers, with blades that could be streamlined into the airflow, which stopped both propeller and disabled engine. Full feathering propellers were ordered on all commercial transports. Air line competitive flying in bad weather was stopped. Resentment at some of these actions changed to almost universal approval as months went by with no accidents. Then the President under the Reorganization Legislation shifted the C.A.A. back to the Commerce Department for reasons of economy and executive efficiency. It is stated that while this move cannot necessarily be blamed for the average of nearly a crash a month since it was made, it is pointed out that because the Department of Commerce is charged with maintaining the civil airways, airway personnel, and aids to air navigation, its investigation of crashes calls for passing judgment on its own efficiency. The writer believes this is the chief reason why its reports on airline accidents since reorganization have been wordy rather than precise. Doubtful points about some of the recent crashes are also discussed. *Liberty*, March 8, 1941, pages 13–15, 2 illus.

More about Light Planes and National Defense. Richard H. Depew, Jr. The importance of light airplanes for primary training of the thousands of pilots needed to fly the thousands of military aircraft on order, is outlined. The writer who has been a military and civilian pilot for thirty years, believes that primary training on the light airplane can be of great value, and bases his opinion on results of the German light airplane and glider pilot-training methods. He points out the importance of enabling all civilian pilots to hold their licenses by means of low-cost flying time in light airplanes. *The Sportsman Pilot*, February 15, 1941, pages 8, 38, 40.

The Opinions of Two Experts on the War. Cy Caldwell. A study and criticism of the testimony given by Col. Charles A. Lindbergh and Major Al Williams before the Senate Foreign Affairs Committee during the recent hearings on the Lend-Lease Bill. The writer points out that the two air experts who opposed aid to Britain as proposed in the bill failed to take into account that the American way of living would have to compete with enslaved labor in Europe if England were defeated, and that the United States would have to embark on an unprecedented armament program to maintain South America as a market. The article also points out that many of the statements made by Major Williams in his book, "Airpower" about the absolute mastery of airpower over seapower, has been disproved by recent events in the Mediterranean. *Aero Digest*, March 1941, pages 52, 274, 278, 1 illus.

An Egg Requires Just So Long to Hatch. Report of a discussion of aircraft production problems by Glenn L. Martin, Col. John H. Jouett and other officials, at a National Press Club luncheon. In reply to a question by an English correspondent, Mr. Martin is reported to have said, "You can put a hen to hatch a setting of eggs, and divide the setting among any number of hens, and put other hens to hatching part-time, but it is still going to take three weeks to hatch those eggs, because that is the time an egg requires to hatch." It was also stated that pre-war trips to Germany and careful examination of German aircraft shot down recently, have lead experts to conclude that the United States has nothing to fear from aircraft production in Germany. Our aircraft are as good or better than anything they have. *U.S. Air Services*, February 1941, pages 36, 40.

Politicians May Throttle N.Y. State Aviation Growth. Discussion of a proposed bill to create a New York Aviation Commission. The writer states that the legislation if enacted into law would duplicate the regulations of the U.S. Civil Aeronautics Board, and provide additional political patronage by taxing airports, pilots, airplane manufacturers and aviation schools. He points out that as aviation is obviously an interstate activity and already well regulated by the Federal Government, the proposed bill would only curtail and discourage aviation in New York State. *Contact*, February 1941, page 3.

The Air Training Corps. Outline of a civilian pilot training program for England. It is stated that due to the difficulties in recruiting enough qualified pilot and observer personnel for the R.A.F. and Fleet Air Arm, 700,000 British boys between the ages of 16 and 18 are to be given part-time training in aeronautics to prepare them for careers as pilots, observers or crew members in the British air forces. Regardless of education or class, these youngsters will be given a chance to qualify and train for the R.A.F. There will be evening classes in ground school study and flight training with various so-called university air squadrons, flight instruction given in connection with English colleges and universities. Ground study and general "background" subjects such as mathematics, chemistry, and physics needed to round out educational requirements for R.A.F. cadets, will be taught by volunteer military and professional men in hundreds of communities throughout England. *Flight*, January 16, 1941, page 57. *The Aeroplane*, January 24, 1941, page 109, 2 illus.

The King-Pin of Operations. Captain Norman Macmillan. Suggestion that British war policy be based upon waging war with machines, conserving manpower as was done in the African campaign. Also that large-scale offensives be planned from a standpoint of air strategy based upon the long distance striking power of bombers, rather than upon use of the air force as an auxiliary arm to both military and naval operations. The writer points out the need of more range for patrol bombers of the Coastal Command, especially for convoy duty, and also suggests that if Army and Navy are forced to continue their demands for large-scale cooperation in special duties by the R.A.F., all estimates of necessary British air strength will again have to be revised sharply upwards. *Flight*, January 16, 1941, pages 51–53.

How Many Planes When? Outline of the problems of production and necessary expansion in the American Aircraft Industry presented by more than three billions of dollars worth of aircraft orders loaded upon plants which turned out only a hundred and fifty millions' worth in 1938. The reasons why Mr. Roosevelt's dream of 50,000 airplanes a year, or Mr. Ford's 1,000 a day, or Reuther's 500 a day, are not attainable at the present, are discussed as well as problems involved in airframe, engine, accessory, and machine tool production. Included is an account of the confusion in Washington regarding production requirements which followed the successful German offensive in the spring of 1940, and which continued into late fall. Present and future needs and capacities in various raw materials are also outlined. *Fortune*, March 1941, pages 80–83, 183–190, 7 illus.

Our Un-Coordinated Army. C. B. Allen. Discussion of the need for greater coordination between the Army Air Corps and the various ground forces. Practice maneuvers are not being made on any scale commensurate with the importance of such coordination, according to an article in *The Cavalry Journal*, by Major Gen. Robert C. Richardson, Jr., which is quoted by the writer. While conceding that warfare in this country would not be conducted along the same lines as in Europe, Gen. Richardson believes that the Army should train "combat teams of great strength, which can strike with speed and ferocity." *Western Flying*, March 1941, page 17, 1 illus.

U.S. Air Power. Hanson W. Baldwin. A comprehensive analysis of air power and air policy in the United States. The writer, military and naval correspondent of the *New York Times*, opens with a description of what might happen if Great Britain were defeated, with U.S. air power mobilized and on its way to forestall German aid for a Nazi uprising in Brazil. He then says that the only thing wrong with the picture is that the air fleets don't exist, except on paper, and in the productive capacity of the American Aircraft Industry. Our immediate need for more airplanes is outlined, together with our great gamble on "all out" aid to England, especially in giving the British priority on sorely needed military aircraft, and our 1941–42 building program. The need for more pilots, more air crews, more mechanics, more air bases, to take care of additional thousands of new airplanes, is shown and some of the plans of Army and Navy for increased training, are given. The writer also suggests that the United States continue to give England priority on fighters and light and medium bombers, but that we should retain practically all the heavy long-range bombers we can produce. *Fortune*, March 1941, pages 75, 76, 226–236.

There Are No Miracles in Aircraft Production. Col. John H. Jouett. Outline of aircraft production plans in the United States, including the problems that have been, and remain to be, overcome. Progress made in increasing the production rate, both by expansion of present aircraft plants and extending the scope of sub-contracting and sub-assembly to include many other types of plant facilities, is also described. *Canadian Aviation*, February 1941, pages 31–33, 67, 5 illus.

Why We MUST Have a Separate Air Force. Alexander P. de Seversky. A summary of most of the arguments presented in favor of a separate air force, explained in layman's language. Evidence to support this contention is taken from recent occurrences in the European war, such as the evacuation of Dunkirk, the sinking of the Southampton and the crippling of destroyers in the Mediterranian by aircraft. The reactionary viewpoint held by old line military strategists who have not permitted the fullest exploitation of aircraft for defense is criticized, and the suggestion is made for a complete separation of the air force from both the Army and Navy. *Reader's Digest*, March 1941, pages 107–113.

Air Transport, an Ally of National Defense. T. B. Wilson. Digest of a paper presented before the Institute of the Aeronautical Sciences. Background of the Air Transport Industry is outlined together with what it can and has contributed to military aviation. Different authorities are quoted, including the British magazine *Flight*, to the effect that war necessitates expansion, rather than contraction or elimination of domestic air transportation. The writer believes that the domestic air lines should be expanded along with military aviation, and assist in the training of military operations personnel. *National Aeronautics*, March 1941, pages 23, 45.

The Aircraft Program Passes in Review. Carl Vinson, Chairman House Naval Affairs Committee. Outline of some of the aircraft procurement problems as discussed before the Naval Affairs Committee. Chief among these are many changes in design due to developments in the war, the problem of more widespread sub-contracting, and the problem of strikes and labor disputes. *National Aeronautics*, March 1941, pages 7, 8, 4 illus.

Civil Air Reserve under C.A.A. Quotations from military and political authorities stressing their approval of organizing a Civil Air Reserve under the supervision of the C.A.A. Secretary Knox favors the idea but believes that it should remain under the sponsorship of the Civil Aeronautics Authority. *National Aeronautics*, March 1941, page 26.

What Can Be Done to Correct These Situations in the Aircraft Industry? Gordon Searle. This article indicates that in the writer's opinion, the United States, in trying to step up aircraft production, has failed to profit from the experience of Great Britain. In trying to get airplane production to reach automobile output proportions, they have drafted the services of automobile production experts. These men are able to think only in terms of automobile production figures and methods, in fixed design and complete detailed tooling. This type of production would preclude the constant change which modern warfare would make necessary. The writer suggests that one of the methods of overcoming production difficulties is to return control of aircraft production to aircraft experts. *U.S. Air Services*. March 1941, pages 12, 13.

Transport Priorities and Airline Progress. Kendall K. Hoyt. A plea for continued development, manufacture and delivery of commercial transports to keep pace with the expansion of the domestic airlines. It is said that Germany's transports total about fifteen per cent of her total fighting strength, whereas present transport strength in the United States would be about one per cent of our military aircraft on order. In addition, Great Britain is said to have more converted American transports on patrol duty over the Irish and North seas than there are in the United States. The importance of transports to hemisphere defense is also discussed. *National Aeronautics*, March 1941, pages 10, 11.

If This Is Not Screwy, What Is It? This article indicates the fallacy of permitting local draft boards to take students taking courses in mechanics and engineering at C.A.A. approved schools and skilled workers whose services are urgently needed in aircraft factories. According to this article, these students are, at their own expense, making themselves more valuable to National Defense as technicians than as soldiers, and should be deferred in order that they may acquire the knowledge and practice they need. Thus these men could serve the nation better in factories than they could in Army camps. *U.S. Air Services*. March 1941, page 9.

American Export Airlines Meets Congressional Rebuff. T. N. Sandifer. A survey on the decision by the sub-committee of the House of Representatives in charge of postal appropriations to deny the Post Office Department funds with which to pay American Export Airlines for their proposed transatlantic air mail service. The testimony by Assistant Postmaster General Purdum, John E. Lamiell and other Post Office officials most of whom indicated the advantage of the second line between the United States and Europe. Representative Louis Ludlow, chairman of the sub-comittee offered the body's reasons for the denial of funds, stressing the saving of $9,000 per trip made by allowing Pan American Airways to maintain its present monopoly. Figures on the cost of the new line, and the improvement it might have offered are included. *U.S. Air Services*, March 1941, pages 19, 29.

The C.P.T.P. . . ? Virginia Withington. A discussion of the Civilian Pilot Training Program which traces the development of the movement from its inception as part of the National Youth Administration in 1939 up to the present, when it is being applied as a channel for providing the Army and Navy with

possible candidates. The political pressure that influenced the curtailment of the program and may finally end it altogether, the opinions of high ranking Army and Navy officials on the value of the program is outlined. *Flying and Popular Aviation*, March 1941, pages 31, 58, 72, 2 illus.

Airports

Winter Always Comes. H. A. Scribner. Outline of the advantages of the rotary snow plow for clearing airport runways. The plowing unit of the machine consists of three augers which carry the snow to a central opening where it is picked up by a high-powered fan and shot through a discharge spout for a distance of 150 to 200 feet. In this way, snow is cleared from the runways and discharged into the unused sections of the field. It is said that some plows are equipped with two-way radio for communication with the control tower. *Aviation*, March 1941, pages 59, 60, 3 illus.

Over Gravelly Point in a Blimp. Griffith Brewer. The President of the Royal Aeronautical Society describes his flight over the new Gravelly Point airport near Washington, D. C., calling special attention to the hard-surfaced runways. These, Mr. Brewer recommends highly, suggesting that they be more widely used in England. *Flight*, January 23, 1941, pages 75, 76, 1 illus.

Investing in Progress. William Flynn. History and description of the new $6,000,000 airport at San Francisco. The field, rapidly nearing completion, will have land and seaplane facilities for the Coast Guard, T.W.A., United Air Lines and a score of private operators. *Western Flying*, February 1941, page 35, 1 illus.

New Air Corps Depots. Descriptions of new military airports now being developed for the U.S. Army Air Corps. Near Ogden, Utah, Hill Field Army Air Depot is being constructed as part of the Air Corps' expansion program. At Manchester, N. H., the Municipal Airport is being converted into a sub-base for Westover Field, Chicopee Fall, Mass., the important base for the Northeast Area. At Stout Field, Indianapolis, Ind., the National Guard flying field is being expanded to serve as a part of the defense network, while the Municipal Airport at Albuquerque, N. Mex., is being made into one of the largest fields in the country. It will be the depot for the Fourth Army Air Corps. The work now in progress is outlined. *Aero Digest*, March 1941, pages 56, 58.

Air Transport

Jungle Gold. History of the Guinea Airways, and how air transport was used to open and develop the rich gold fields of New Guinea. Reprinted from the *Intavia World* for October (see *Aeronautical Review* for January, page 31.) *Aeronautics*, February 1941, pages 32–35, 7 illus.

Housekeeping Aloft. John M. Mecklin. A survey of the problem of keeping an air line adequately supplied with clean linen. D. F. Magarrell, United Air Lines' director of passenger service, reveals facts and figures on keeping passengers comfortable on the 5,200 mile line and serving 750,000 meals annually. The job calls for washing 45,000 pieces of linen 125 times. Other interesting facts on air line housekeeping are also given. *Airlines*, February 1941, pages 11, 20, 3 illus.

Seaplane or Landplane for Transoceanic Service. Michael E. Gluhareff. The chief of design for the Vought-Sikorsky Aircraft Division of the United Aircraft Corp. compares large flying boats with large land air transports for long distance overwater air service. He believes that in sizes from fifty to one hundred tons the flying boat would offer advantages of safety convenience, and at the same time would have an equal cruising speed combined with greater payload or longer range than a land airplane of similar size and power. Design factors are offered to show that the payload or range differential should be approximately 20 per cent. *Aviation*, March 1941, pages 38, 39, 124, 126, 6 illus.

Linking the Empire at War. Details of various passenger services which were maintained by British air lines in 1940 despite the war. These included transatlantic service by the Clare and the Clyde as well as routes in the Near-East and Far-East, and the North-South routes across Africa. *Flight*, January 16, 1941, page d, 2 illus.

We Fly a Bomber to England. Frank Gervasi. An American correspondent flies back to England aboard a PBY patrol-bomber flying boat being ferried over by a British crew. While no details of the flight are given for obvious reasons, the writer describes his reactions to knowledge of the danger involved. Also included is an account of his trip to London and a description of the effects of war upon the city, and more especially upon the English people. *Collier's*, March 22, 1941, pages 13, 63, 64, 2 illus.

Eddie Rickenbacker Looks Ahead. Outline of the future of aviation as seen by Eddie Rickenbacker. He believes that the time will come when first class mail, most of the present rail passenger business, and much, of the freight now hauled by trucks will go by air transport. The 10,000 aircraft required for carrying all first class mail would be surplus bombers and military transports bought from the Government after the war. He also forsees the steady increase in private flying brought about by cheaper and safer light airplanes combined with the urge to fly engendered in the thousands of young people now working in the aircraft industry. Capt. Rickenbacker also believes that dirigibles will again be used for extensive over-water passenger service as well as for aircraft carriers which will be able to remain at sea on patrol duty for a month or more, being refueled and serviced from the air. *Fortune*, March 1941, pages 118–121, 148, 150, 152, 5 illus.

The Coming Struggle for the Air Lanes. Outline of world air routes, how they have developed, what countries operate them, the part Pan American Airways has played in extending American air transport throughout the world, and some of the questions of policy brought out by plans for future American expansion. Some of the latter include the number of carriers handling U.S. transoceanic air commerce, the issue of negotiating landing rights with foreign governments, as well as the development of U.S. air policy both in Latin America, and at home. It is shown that much of our home air policy is bound up in problems of national defense and defense zones in foreign areas. *Fortune*, March 1941, 124–128, 152, 155, 156, 159, 160, 193, 194, 13 illus.

"Grand Central" of the Airways. Allen Warren Elliott. Popularized description of La Guardia Field. Air traffic, traffic control system, passenger facilities and details of maintenance problems and operation are given. *Popular Mechanics*, March 1941, pages, 337–344, 128A, 17 illus.

"Flight 14." MacDonald Hays. T.&W.A. captain describes the preparation which precedes take-off on a regular passenger flight, indicating reasons for the careful checks with meteorologists, with engine data, navigational guides and the Airway Traffic Control. Once in the air, more careful verification of data must be made, and a detailed log kept. Landing procedure is an equally scientific operation. The importance of all of the flight routine is explained. *Flying and Popular Aviation*, March 1941, pages 42–44, 5 illus.

Western Air Express: An Industry Portrait. Selby Calkins. On April 17th, Western Air Express will have completed fifteen years of service. This article outlines the history of the organization which has retained its identity longer than any air line in the United States, relating its early struggles giving character sketches of its first pilots, mechanics and executives. *Western Flying*, February 1941, pages 26–29, 44. 9 illus.

Littlest Line. Edward Churchill. The history of Catalina Airlines, the shortest run in the United States which makes the 16 minute flight from Wilmington, California, to Avalon, on Catalina Island. A biography of Walter Seiler, chief pilot of the line is also included. *Flying and Popular Aviation*, March 1941, pages 26–28, 78, 80, 4 illus.

Was Ist Vom Weltluftverkehr Noch Uebrig? (What Is Left of World Air Traffic?) The effects of the war are not only felt in earthbound traffic, but also in air transportation. Yet there still exists a world air traffic, and several international and intercontinental air routes have become very important as a result of the war. The writer mentions air routes which have been discontinued, those which are still maintained, also those which have been re-established or rerouted. Due to this rerouting the line Capetown-Sidney becomes the longest one in the world—26,500 kilometers. *Schweizer Aero-Revue*, December 1940, page 367.

Armament

Aircraft Armor. Horace J. Alter. General description and discussion of aircraft armor. Factors that govern position, thickness, and resistance characteristics, are outlined. Bullet-proof glass, its construction and thicknesses necessary to withstand different size projectiles is also described. *Army Ordnance*, March-April 1941, pages 497, 498.

Biography

An Investment in Aviation. One page biographical sketch of William Allen Patterson, President of United Air Lines. His interest in aviation began with a ride in an old pusher-type biplane and continued when as a young bank employee, he was given the account of the Pacific Air Transport Company to supervise and service. Later he resigned from the bank and became assistant to P. G. Johnson of the Boeing Airplane Company in Seattle. From there he began growing with United, until 1934, when he became president. *National Aeronautics*, March 1941, page 16, 1 illus.

Captain John Gilbert Winant, Ambassador to the Court of St. James's. Biography of John G. Winant, former U.S. Army pilot, recently appointed U.S. Ambassador to England. *U.S. Air Services*, March 1941, page 17.

John D. Biggers of Ohio. A biography of John D. Biggers, president of the Libby-Owens-Ford Glass Company, recently appointed Director of the Office of Production Management of the National Defense Advisory Commission. *U.S. Air Services*, March 1941, page 18.

Hero from Winona. Betty L. McKelvey. Max Conrad of Winona, Minn., attracted nation-wide attention by his heroism in rescuing scores of duck hunters who had been trapped in the recent Armistice Day blizzard. This biography outlines the life of a mechanically inclined youngster who had to stand on a kitchen chair to repair the family car, and who started his chain of 18 C.P.T.P. flying schools by making parachute jumps to pay for his first parachute. Now a success, he makes a point of passing his good fortune on to other young men. *Flying and Popular Aviation*, March 1941, pages 35, 36, 80, 3 illus.

The Man Who Wasn't Satisfied. Biographical sketch of Floyd Smith, who developed the manually operated free-type parachute. A narrow escape as a test pilot for Glenn L. Martin started him on the search for a parachute that a pilot could open in mid-air. When pilot after pilot was killed in France for lack of a parachute, Gen. William Mitchell inquired who in the United States knew most about parachutes. As a result Smith was put on parachute experimental work at McCook Field, and permitted to continue it after the war ended. By Army command a youngster named Leslie L. Irvin made the first live jump in the new parachute the morning of April 28, 1919. A crowd gathered to watch him commit suicide, and remained to see the first successful "free parachute" jump. Many interesting events in the career of this acrobat, early flyer, and parachute manufacturer, are described. *Commercial Aviation*, February 1941, pages 26–28, 38, 7 illus.

J. A. (Jack) Herlihy. Biographical outline of the career of the Operations Chief of United Air Lines. Graduate of M.I.T. and the Navy Air Corps, he became an airport construction engineer for Transcontinental Air Transport, and later chief engineer for the same company. A change of management started him from the bottom once more with another company. He became a pilot for National Air Transport, then assistant to the general superintendent, and following the formation of United Air Lines, he advanced rapidly to his present position. *U.S. Air Services*, February 1941, page 34.

Merrill C. Meigs Is a Fine Asset. T. N. Sandifer. One page biographical sketch of the Director of Aircraft Section, National Defense Advisory Commission. Chairman of the Chicago Aero Commission for fifteen years, he numbers among his accomplishments flying, water polo and football of All-American calibre, and a successful career as a newspaper publisher. *U.S. Air Services*, February 1941, page 26, 1 illus.

A. E. Shelton. One page biography of the President of the Menasco Manufacturing Company. With a practical background in costing and factory production he has been in charge of purchasing for T.W.A. and Lockheed. Eighteen months ago he was made president of the newly reorganized Menasco Manufacturing Company which now has a backlog of $4,000,000 and is beginning to show a profit. *Western Flying*, March 1941, page 25, 1 illus.

Business and Finance

Aviation's Battle of Production. Selig Altschul. Business analysis of the American Aviation Industry. The writer gives his views on why securities of leading aircraft manufacturers depreciated in value during 1940 despite the increase in plant expansion and production. *Aviation*, March 1941, pages 73, 114.

Design

Oscillation of Castoring Wheels. J. Lockwood Taylor. An investigation of the dampening required to overcome the oscillation of the front wheel of a tricycle undercarriage. *Aircraft Engineering*, January 1941, page 13.

Tricycle Undercarriage Development. W. Wernitz. A review of the evolution of the tricycle undercarriage in the United States, England, Germany and Italy. The writer, after sketching the early development of this gear before the first World War and immediately after it, states that present development started with the N.A.C.A.'s attempt to create a fool-proof airplane in 1931. The conclusions made by Fred E. Weick, then of the N.A.C.A., on the advantages of this arrangement are summarized. Descriptions of important sport, commercial and military airplanes equipped with tricycle landing

gear are given, and a table of these craft and their weight, power and performance is provided. *Aircraft Engineering*, January 1941, pages 6–12, 19 illus.

3 Wheel Chassis. W. O. Manning. Analysis of the many advantages of the tricycle landing gear. The writer believes that the British will soon adopt it to permit the design of faster aircraft with greater landing speeds. *Aeronautics*, February 1941, pages 44–46, 7 illus.

Per Ardua ad Astra. W. O. Manning. Discussion of design problems in the development of military aircraft for high altitude flight. It is stated that bombers which could operate at 45,000 feet would necessitate a new type of high altitude fighter-interceptor. Problems of supercharging, gunfire control, pressure cockpits and cabins, and engine horsepower, involved in the design of such an interceptor are briefly outlined. *Flight*, January 16, 1941, pages g, h, 49, 50, 2 illus.

A Captive Composite. Another approach to the problem of assisted take-offs to facilitate longer range and better payloads for fighter and bombing airplanes. Differing from the Mayo-Composite system of the Pick-a-Back seaplane, or the Pemberton-Billing Slip-Wing idea, the new method, suggested by B. B. Shead, employs a whirling arm. The arm is aerodynamically shaped and is powered by two engines and tandem propellers. Properly counterweighted, the whirling arm moves at a speed sufficiently slow to avoid excessive centrifugal force. The airplane is set on the arm at the proper bank and tail elevation for a safe take-off. *Flight*, January 23, 1941, pages a and b, 2 illus.

Viewed in Perspective. T. P. Hall. A description of a new midway step between the designer's drawing of a proposed airplane and the full scale mock-up—the perspective drawing or perspectograph. This new system, developed by Joe Szakacs, engineer-artist of Consolidated Aircraft Corp., crystallizes the engineer's ideas and creates from them cutaway drawings of the craft, drawn to scale with minute accuracy. This system often reveals errors due to engineering assumptions, which ordinary three-view drawings would fail to show. The mechanics of the perspectograph are explained. *Western Flying*. February 1941, pages 30, 31, 2 illus.

Engineering Considerations of War Problems. Edgar S. Gorrell. Putting into practice engineering experience acquired during the first World War, the writer states that engineers designing and producing military airplanes should keep in close contact with men in actual combat in order to keep informed on what is required of fighting equipment. Although it is important that an air force keep ahead of its opponents in aircraft innovations, it is equally important that the established type be maintained until the substitute type has proved itself in combat. *Aero Digest*, March 1941, pages 288, 289, 1 illus.

L'Aeroplano a Reazione (Airplane with Jet Propulsion). Last August successful flight tests were made at Milan, Italy, with an airplane with jet propulsion. This new type of airplane which has no propeller has been designed by the Italian engineer Campini. It weighs about 4,000 kilograms, has a sealed cabin for high altitude flights and a retractable landing gear. The engine is patented in all principal countries. *L'Aviazione*, October 28, 1940, page 3.

Shock Absorbing Systems. Walter A. Semion. Part 2 of an article dealing with the problems of shock absorber systems of large military and commercial airplanes. This section of the article offers solutions to problems presented in Part 1, as well as a theoretical derivation of the main landing gear efficiency of the DC-4, followed by a numerical example. *Aviation*, March 1941, pages 54, 55, 4 illus.

Proposed Changes in C.A.A. Regulations for Wheel Brakes. An outline of the proposed regulations for the approval of aircraft brakes. The proposed section 15.104 establishes formulas, procedure and tests for determining the minimum brake size which will permit safe operation of aircraft. *Aero Digest*, March 1941, page 114.

Engines

Simple Airplane Engines Made from Auto Parts. Description of a 93-hp. air-cooled aircraft engine utilizing seventy per cent of Ford V8 automobile engine parts. The power plant was designed by James Church, aeronautical engineer. *Science News Letter*, February 22, 1941, page 121.

Allison V-1710-E4 Engine. A technical description of the Allison V-1710-E4, 1150-hp., 12-cylinder, liquid-cooled engine. This power plant, with an 8-foot propeller shaft is used in the Bell Airacobra. *Aero Digest*, March 1941, page 248, 1 illus.

Aero-Motors from The United States for Great Britain. Descriptions, performance figures and pictures of power plants supplied to the R.A.F. by manufacturers in the United States. Types of airplanes powered by these engines are listed. Engines included in this survey were built by the following companies: Allison Engineering, Continental, Jacobs, Lycoming, Pratt and Whitney, Warner and Wright. *The Aeroplane*, January 17, 1941, pages 98–100, 16 illus.

Aircraft Engines. Data and illustrations on 49 basic types of power plants built under C.A.A. Approved Type Certificates for private, military and commercial aircraft. Specifications construction and accessory data where available are provided. *Aero Digest*. March 1941, even pages from 202–212, 49 illus.

Aircraft Engines (without A.T.C.s). Descriptions and data on 12 basic types of aircraft engines being built in the United States which have not as yet been awarded an Approved Type Certificate by the C.A.A. *Aero Digest*, March 1941, pages 220, 222, 224, 12 illus.

Manufacturers of Aircraft Engines. An alphabetical list of aircraft power plant manufacturers, giving their location and key personnel. *Aero Digest*, March 1941, page 126.

Horsepower. George E. Haddaway. Discussion of the problem of engine design and production in the United States. It is indicated that regardless of respective merits of in-line versus radial aircraft engines, the manufacturers of radials are in production with engines of 2,000 hp. while in-line production is lagging on engines of 1,000 and 1,200 hp. *Southern Flight*, February 1941, pages 11, 19, 1 illus.

Determinazione Sperimentale del Coefficiente di Efflusso per l'aria dei Boccagli Unificati I.S.A. (Experimental Determination of the Flow Coefficient of a Standard I.S.A. Metering Jet). A. Castagna. Explanation of experimental research results on the flow coefficient a of the standard I.S.A. metering jet at low Reynolds numbers R_p. The coefficient a increases with the decrease of R_p below the values of the order of hundreds showing the increase of the capacity of laminar flow. *Pubblicazioni del Laboratorio di Aeronautica*, No. 138, May 1940, 11 pages, 2 illus.

United Aircraft. An account of production expansion at Pratt & Whitney, and of the assistance they are giving Ford and General Motors in their preparations to produce Pratt & Whitney aircraft engines. A brief history is given of the events which led up to the huge increases in backlogs of United's operating subsidiaries, especially Pratt & Whitney, which will be called upon to produce 35,000 engines over the fiscal years 1941–1942, representing nearly half a billion dollar backlog. Production

in both the new engine plants and the propeller plant is described. *Fortune*, March 1941, pages 86–89, 169–174, 7 illus.

The Engine and the Propeller. Discussion of modern aircraft engines. The principal points advanced by proponents of air-cooled and liquid-cooled engines are outlined as well as recent developments in supercharging, fuels and lubricants, and future possibilities of two-cycle engines. The writer also describes the function, design and development of the modern aircraft propeller from the simple fixed-pitch propeller used with most light airplanes, to the variable pitch, constant speed, full-feathering, and even reversible pitch propellers found on large flying boats, land transports and military aircraft today. *Fortune*, March 1941, pages 114, 115, 130–134, 11 illus.

Engine Parts and Accessories

Problems Relating to the Control of Flow in Superchargers. Nathan C. Price. Comparisons are drawn between the flow control problems of engine superchargers and cabin superchargers, and new methods for obtaining improved flow control are described. It is shown that the necessity for regulation of flow, pressure and rate of pressure change in pressure cabins requires the solution of numerous new problems. The advantage of simultaneous design of both supercharger and control system, and the desirability of having both in an integral unit, is discussed, together with present development trends in engine and cabin supercharging. *S.A.E. Journal*, March 1941, pages 118–124.

Supercharged Aircraft Ignition Harnesses. Carl E. Swanson. Discussion and description of the operation and performance of supercharged ignition harnesses. *S.A.E. Journal*, March 1941, pages 107–115, 6 illus.

Ice-Free Carburetors for Lightplanes. L. V. Kimball. Description of a method for injecting ethyl alcohol into the air intake of a light airplane carburetor as double protection against carburetor icing. The apparatus includes carburetor fitting, cockpit control, supply line and a one-gallon tank fitted aft of the cabin. Details of operation and installation are given. *Aviation*, March 1941, pages 48, 122, 2 illus.

Alcune Applicazion della Equazione del Moto Vario dei Liquidi Allo Studio dei Vari Carburatori (Some Applications of the Equation of the Different Motion of Fluids, in the Study of Various Carburetors). A. Capetti. By means of the properly simplified Euler equation the variation of the capacity of a carburetor jet may be examined and applied to two cases: determination of the time necessary to approach maximum capacity conditions in case of rapid acceleration of the engine, and determination of outflow velocity and mean capacity while operating periodically. *Pubblicazione del Laboratorio di Aeronautica*, No. 136, April 1940, 11 pages, 7 illus.

Carburettor Tuning and Testing. D. Ramsay. A discussion of the factors considered and methods applied in testing a carburetor for a specific type of engine. After explaining the effect of mixture strength on engine conditions at various pressures and engine speeds, methods of measuring mixture strength and determining the limits of accuracy required in metering are outlined. Rig testing methods for the prototype carburetor, the application of these findings to the production model and the tuning and testing of the device actually installed and flight tested are described. The writer concludes that a given design for a carburetor can best be developed by rig testing, the actual operating conditions and requirements having been determined by engine tests. *Aircraft Engineering*, January 1941, pages 2–5, 13, 7 illus.

Flying Engineer. Kenyon Kilbon. A description of the work of Herbert V. Shebat, engineering pilot for the Wright Aeronautical Corporation. Objects and methods of the engine tests, conducted at the Wright experimental laboratory at Caldwell, N. J., and the photographic method of recording these tests flights are described. *Popular Science*, April 1941, pages 49–51, 5 illus.

Fuels and Lubricants

Lubricating Oils for Internal-Combustion Engines. Lloyd H. Mulit and Frank W. Kavanagh. Discussion of a number of factors in the selection and use of lubricating oils. The writers stress the need for engine or service tests, as usual specifications indicate only general characteristics. It is shown that performance characteristics such as limiting cranking temperatures, oil mileages, and gear-shifting temperatures can be determined from viscosity figures, but others of interest to the user such as stability, ring-sticking, gumming and wear cannot be predicted from inspections. Data are presented to show how compounded oils meet the severe present-day conditions of increased mechanical and thermal loads, especially in high speed diesels. It is pointed out that compounded oils cannot be judged by simple laboratory tests, but must be selected on the basis of performance in full-scale engines. Various tests are described together with the significance of viscosity and viscosity index. *S.A.E. Journal*, March 1941, pages 98–106, 18 illus.

Oil and Strategy. Sir Herbert Ingram. An analysis of Germany's oil reserves and supply, and of the way in which it may affect future operations by the Axis. The writer believes that it will be fuel shortage rather than food shortage that will eventually slow down the German war machine. He estimates that Hitler has only enough oil for a comparatively short invasion attempt, and suggests the possibility of launching a Balkan drive into the Near East to augment his supply. Fuel for this attempt would come from Roumania. *Aeronautics*, February 1941, pages 53–55, 2 illus.

Gliding and Soaring

An Introduction to Soaring. Robert M. Stanley. Interesting structural points about modern sailplanes. Due to the fact that they must often stand the gust acceleration loads of flying in storms and very turbulent air, they are commonly built with a strength factor of ten. Some of them are so aerodynamically efficient that they have a gliding ratio of 30 to 1. It is also said that modern sailplanes are often more heavily built than formerly, and that weight is not considered critical as long as aerodynamic efficiency is retained. The use of spoilers or air brakes to control the glide path for landing, is described together with the different types of landing gear. The problems of dismantling, transportation and assembly are also outlined. *Soaring*, December 1940, pages 8, 9.

Soaring in South Africa. Frank Hatfield. A survey of gliding activity in South Africa. Included is a brief description of the eight active clubs, as well as pilot requirements for A, B, and C glider pilot licenses. Problems of glider terrain, equipment and financing are also discussed. *Soaring*, December 1940, pages 4–6, 4 illus.

Second Annual "Snowbird" Contest. Contest log of a late November Soaring Meet held at the Warren E. Eaton Motorless Flight Facility near Elmira, New York. Descriptions of several flights are given together with the final point scores of completing pilots. *Soaring*, December 1940, pages 3, 6, 1 illus.

Soaring in Aviation. J. J. Smiley, Jr. General description and dis-

cussion of gliding and soaring, from a brief historical background to present-day methods of instruction and motorless flight. Thermal and slope soaring are described and the value of soaring instruction for youngsters of pre-military age is once more stressed. *Commercial Aviation*, February 1941, pages 22–25, 40, 4 illus.

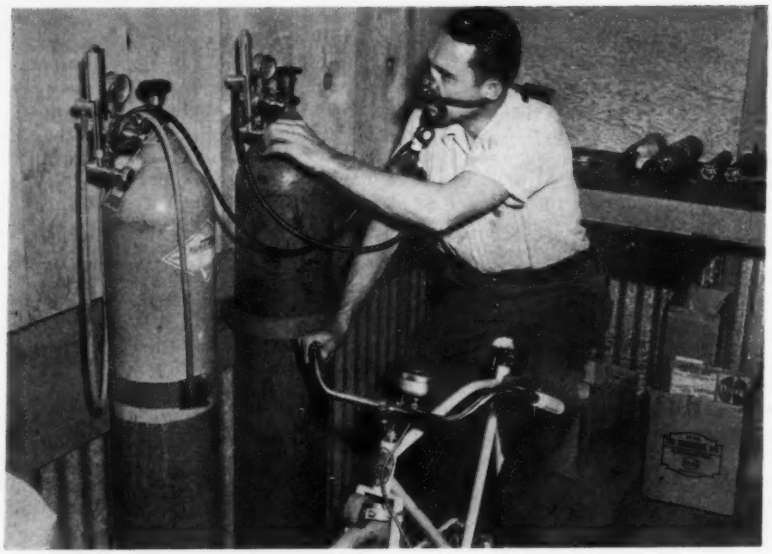
Training Tomorrow's Pilots. Suggestion that glider training be given Canadian boys who are too young to join the R.C.A.F. It is stated that U.S. Army and Navy officials have endorsed glider training because it develops initiative, teamwork, and introduces the beginner to flight, aerodynamics and meteorology. Gliding instruction would be given in connection with the Canadian Air Cadet League. *Commercial Aviation*, February 1941, pages 18, 19.

Gliding and Air Defense. Lewin B. Barringer. The writer suggests that glider training be used to enable thousands of youngsters from fifteen to nineteen to make the transition from boyhood interest in aviation to regular civil or military pilot training. As a commercial pilot he points out many instances in which glider training has prevented serious difficulties. Costs, manufacturing facilities, and the ability of the Soaring Society of America to train instructors necessary for a large-scale program, are also discussed. *U.S. Air Services*, February 1941, pages 13 14, 38, 1 illus.

High Altitude Flying

Supercharged Pilot. Marc Hanlon. More data on high altitude flying based upon recent test flights in the Lockheed P-38 by Milo Burcham. The process of preparing a pilot for high altitude combat in non-pressurized fighter airplanes has been dubbed "supercharging." In the main it consists of lowering the nitrogen content of the blood to avoid bends or aeroembolism by exercising while breathing pure oxygen. Other precautions concerning diet and oxygen supply are described together with experiments conducted on Burcham at the Mayo Clinic. *Western Flying*, March 1941, pages 18–20, 30, 5 illus.

High Altitude Speed Tests of the P-38 Interceptor. Test flying the Lockheed P-38 interceptor entailed special precautions to protect the pilot, Milo Burcham, against the effects of aeroembolism (the bends), the ailment suffered by deep sea divers. The ill effects of this condition are prevented by methods developed by the Mayo Clinic and the Army Air Corps Medical Section at Wright Field. Thirty minutes before taking off, the pilot goes into a chamber and breathes oxygen through a mask while exercising. He emerges from the tank still breathing oxygen. His supply of oxygen continues uninterrupted until the high altitude test flight is completed. Thus far, Burcham has exhibited no ill effects from test flights at 30,000 feet, due to this protection. *Aero Digest*, March 1941, pages 88, 92, 6 illus.



Supercharging the pilot. Milo Burcham, Lockheed test pilot, fortifies himself against the ill effects of high altitude flying by breathing pure oxygen for a period of thirty minutes while exercising on a stationary bicycle in a special decompression room built adjacent to the test hangar.

When Pilots Reach the Ceiling. Roy Davis. An interesting digest of a German handbook "Medical Guide for Flying Personnel," by Heinz von Diringshofen, Chief Surgeon of the Luftwaffe. The effects of high-altitude flight on the human body are discussed, together with a description of physiological reactions to centrifugal force on high speed turns and dive pull-outs. Sports most highly recommended in conditioning pilots are mountain climbing and skiing. Notes on diet are also given. *Canadian Aviation*, February 1941, pages 18–20, 71, 8 illus.

History

Chariots for the Glamour Boys. Historical outline of the evolution of the British fighter aircraft. Beginning with the Farman Shorthorn powered by a 70-hp. Renault with a speed of 55 m.p.h., which was sent to France in September 1914, many early British and French fighters are shown and described. Included are Nieuports, Sopwiths, De Havillands, Vickers, Bristols, S.E.5's, Spads, most of them with several types, and in addition, post-war British fighters including types now being used. Interesting notes are given on armament, performance, as well as anecdotes of the men who flew them. *Flight*, February 13, 1941, pages a–136, 43 illus.

Flying as It Was—. Frederick H. Becker. An account of coastal patrol and convoy duty in twin-engined flying boats during the last war. Of especial interest is the writer's mention of dive-bombing training for use against submarines, and the fact that several of these aircraft were equipped with 37-mm. cannon. He states that frequently they were so heavily loaded that the machines required a three mile run to get into the air. *The Sportsman Pilot*, February 15, 1941, pages 18, 19, 32, 34, 5 illus.

L'Invenzione dell'Aerostato (The Invention of the Aerostat). A chronology of the invention and of the development of the aerostat. There were discussions and theories on the possibility of aerial locomotion by static lift, by means of a substance lighter-than-air, at the end of the 14th and 15th centuries. Hopes become feasible at the end of the 17th century with the discovery of the physics of the rarefaction of the air and of the vacuum, and became actual with the chemical discovery of hydrogen at the end of the 18th century. With this gas the invention of the aerostat was assured, although the first aerostat was not floated by means of hydrogen, but by a presumed light gas which turned out to

be heated air. *L'Aerotecnica*, December 1940, pages 914–924.

Eyes for the Army. An account of the development of the Army cooperation type airplane, as the British call their observation craft. Aerial observation in England started with balloons nearly a century after the French invented the idea. Due to reactionary thinking in the general staff, the idea of the balloon and later the airplane met with considerable resistance. The cavalry unit, long responsible for reconnaissance, disliked having early aircraft at maneuvers prior to the first World War because they frightened the horses. Nevertheless, the airplane was adopted for observation, and early in the war, prevented Gen. Von Kluck from completely encircling the 1914 B.E.F.

The evolution of observation equipment from 1911 when the Air Battalion succeeded the Balloon School, up to present-day units equipped with the Westland Lysanders, changes in armament, equipment and duties, is outlined. *Flight*, January 30, 1941, pages a–h, 93, 94, 35 illus.

The New Battlefield. Historical discussion of the developments in military aviation since four German flyers—Göring, Milch, Vandlend, and Udet—informed Eddie Rickenbacker at an informal luncheon that they planned to recapture the German Empire with air power. It is said that Rickenbacker again had dinner with the four in 1935. Milch reminded him of their promise in 1922, and said "Now, come and see." The writer outlines military air tactics in the last war and traces the German air development and its effect on England, Europe and the world. Included is a detailed discussion of England's air defense and the challenge to American production presented by the crucial need for military aircraft by the democracies. *Fortune*, March 1941, pages 64, 66, 69, 206–225.

Instruction

Better Than Bomb Shelters. George Peck. Brief description of Uncle Sam's newly created civilian Aircraft Warning Service. Its function to provide the Army with accurate, immediate and continuous information on attacking aircraft. *Liberty*, February 22, 1941, page 59, 1 illus.

Army Air Corps Is Hiring Outside Help in Training Flyers. Description of Cal-Aero, one of the many civilian pilot schools now being used by the Army for primary training of military pilots. *U.S. Air Services*, February 1941, pages 17, 38, 1 illus.

The Crowell Trainair. Description and details of a new on-the-ground flight trainer in which beginning student flyers may learn to coordinate flight controls, and pilots may keep their coordination and flight "feel" or muscular kinesthesia from growing rusty. Mounted on a shallow, inertia-damped "roly-poly" base, longitudinal control is obtained by a balancing weight suspended under the seat and controlled by the stick. Lateral control is had partly by this same mass balance and partly by the thrust delivered by a small propeller mounted horizontally in front of the dashboard, and controlled by the rudder bar. The rudder changes the line of thrust from the vertical to right or left as the rudder controls are pushed. The flight path is traced by a small spotlight on a flight pattern board. The feel of the Crowell trainer is that of an airplane with very sensitive controls. Tests have shown it to be practicable for giving students the equivalent of the first one or two hours in the air. One of its major practical advantages is the rapid elimination of tenseness at the controls through complete familiarization and practice in coordination. It is being marketed by the makers of the Link Trainer. *Aviation*, March 1941, pages 56, 122, 2 illus.

Half a Million Workers. It is estimated that by August 1st employment in the aircraft industry will exceed 550,000, which is fifteen per cent greater than last year's average employment in steel, and nearly twenty-five per cent greater than in motor vehicles. The increase has been tenfold in thirty months, the fastest growth recorded in any industry in the history of the United States. The writer describes the tremendous training problem caused by the rapid expansion of aircraft production. It is said that practically everyone in the plants are "learners," fresh from courses in welding, riveting, machining, etc. Wages and hours, selection of personnel, and union activities are also discussed. *Fortune*, March 1941, pages 96–98, 163, 164, 166, 14 illus.

Observations in an Avro Anson. Ronald A. Keith. Description of a training flight for student navigators of the R.C.A.F. Air Observers, as the British call them, are given prescribed courses to fly. The pilot obeys their orders as to course and checks on their E.T.A. (Estimated Time of Arrival). The writer found two student navigators off course several times during the trip which he made with them. It was their fourth training flight and they were still comparative novices. *Canadian Aviation*, February 1941, pages 22–24, 4 illus.

The Airman. Beirne Lay, Jr. An inquiry, analysis and description of the airman. Who, what and why he is developing into almost a distinct species which might be likened to the seaman. Beginning with the pioneer and what he and his efforts have meant to the modern pilot, the writer examines the training, life and environment of military pilots, commercial transport pilots, and private flyers. The resulting descriptive picture of each, shows a high degree of insight and understanding. *Fortune*, March 1941, pages 122, 123, 137, 138, 140, 4 illus.

Thousands of War Birds. Douglas J. Ingells. The first in a series of articles on the method the U.S. Army Air Corps is using to secure and train the 50,000 pilots needed to man the aircraft already on order. This installment outlines the method of selecting candidates, explains the Army's requirements for appointment and the basis upon which the choice is finally made. Pre-flight courses of the cadets are also described. *Model Airplane News*. March 1941, pages 6–8, 34, 38, 39, 41, 20 illus.

Training Men for Defense Industries. John W. Studebaker. Personnel training problems facing defense industries in general and the aircraft industry in particular are discussed by the U.S. Commissioner of Education. Plans for different types of training are outlined, including the special courses given to college men with an engineering background. Colleges giving the latter are listed. *National Aeronautics*, March 1941, pages 12, 13, 5 illus.

Getting Their Wings. III. Outline of advanced training for R.A.F. pilots and observers. From the Elementary Flying Training School they go to the Service Flying Training School where fighter pilots are trained on North American Harvards or Miles Masters, and bomber pilots and observers fly in twin-engined Avro Ansons or Airspeed Oxfords. Night flying, advanced combat and formation flying, and actual practice "missions" both in dummy trainer cockpits and cabins on the ground as well as regular training flights, make up the greater part of their daily curriculum. *The Aeroplane*, January 24, 1941, pages 116, 118, 5 illus.

The Stall and the Turn. J. F. Guilmartin. A clear, academic explanation of the various kinds of turns and the physical laws effecting them. An outline of a precise, exact method of telling the student why certain things are in order to execute

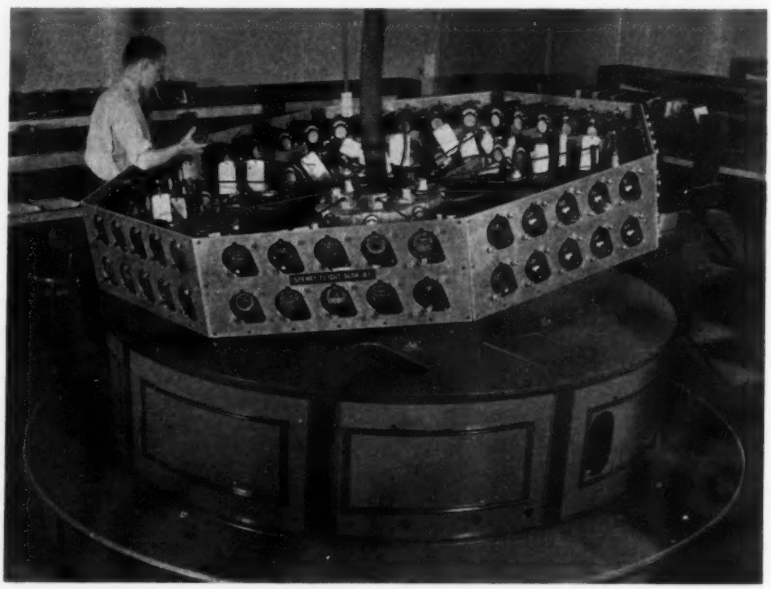
proper turns under varied conditions. Stalls and conditions leading up to a stall are similarly explained. *Flying and Popular Aviation*, March 1941, pages 45, 46, 76, 78, 2 illus.

The Negro Is Flying. Manning Austin. An account of the operation of the Civilian Pilot Training Program at Tuskegee Institute, the first Negro college in the U.S. to institute flight training. The article outlines the struggle against prejudice and financial handicaps, which has born fruit in the development of a training fleet of 12 airplanes, a private landing field and the only C.P.T.P. course entirely owned and operated by a college without outside finance. *Flying and Popular Aviation* March 1941, pages 32–43, 74, 76, 4 illus.

Flight Training in the R.A.F. The intensification of flight training for the Royal Air Force has not, according to this article, suspended the rigidity with which candidates are selected. It has merely increased its speed of operation. The group in charge of training has not succumbed to mass production training despite the pressure to catch up with the Luftwaffe. The R.A.F. prefers to develop initiative and reliance on perfect individual performance. This article describes the course of training in the Initial Training Wing, where candidates are given primary theoretical and flight instruction. From here, he goes to the Intermediate Training Squadron, where he flies heavier craft, is taught the rudiments of actual warfare and is selected for final work. Those with a natural tendency toward combat are assigned to pursuit work, those who show talent toward long range flying go to bombing, etc. Here, the pilots get practice in actual service craft and are then sent to their regular squadrons. *Aero Digest*, March 1941, pages 108, 113, 274, 5 illus.

More Power for Pursuit Planes. C. B. Allen. A survey of the newest developments of the argument of air-cooled *vs.* liquid-cooled engines. According to this writer, the U.S. Army Air Corps was just about to standardize the liquid-cooled Allison engine, when the Navy produced the Vought-Sikorsky fighter, powered by an 1,850-hp. air-cooled engine with a top speed reported at over 400 m.p.h. The power differential between the largest air-cooled and liquid-cooled available being nearly 1,000 hp., additional weight is added to the air-cooled side of this ancient dispute. The writer credits Dr. Jerome C. Hunsaker of M.I.T. as stating that recent research had shown it was possible to streamline the installation of air-cooled engines so that their resistance to forward motion would be no greater than liquid-cooled engines of the same power. The statement is given as a reason why the Army has not closed the door on the air-cooled type of power plant. *Western Flying*, February 1941, page 25, 1 illus.

Four Bases Operated by Parks to Meet Training Program. An account of how the Parks Air College grew in twenty months from a single institution with 300 students to four bases, six air ports and a total of 275 airplanes. How the expansion to accommodate the additional C.P.T.P. and Army Air Corps students, providing for both educational facilities and living quarters, is described in this article, which also gives a brief history of the school and a character sketch of Oliver Parks, President of Parks Air College. *Aero Digest*, March 1941, pages 96, 100, 104, 5 illus.



This multiple test stand used to simulate the motion of an airplane in flight makes the simultaneous pre-flight testing of eight Sperry artificial horizon and directional gyro units possible. This device has assisted the Sperry Gyroscope Company in stepping up the rate of instrument production to a point where the present monthly output equals that of the entire year of 1938.

Instrument Flying

The Military Pilot's Need for Instrument Flying Instruction. Fred Smith. The writer states that while the U.S. is paying for thousands of airplanes for National Defense, only one military pilot out of ten possesses a competent knowledge of instrument flight. The article states that no adequate training in instrument flying is being included in the present air service programs. On the other hand, the German Luftwaffe is conducting all-weather bombing apparently by applying peacetime air line instrument procedures to their warring missions. The need of instrument training for pursuit pilots who must fly up through the overcast to repel instrument flying bombers is indicated, and some of the peculiarities in air service procedure which has minimized instrument flying and instruction thus far are indicated. *Aero Digest*, March 1941, pages 62, 66, 3 illus.

Maintenance

New Test Stands. David Leigh. Descriptions of the new type test stands for hydraulic equipment, developed by American Air Lines manufacturing department. *Airlanes*, February 1941, pages 10, 22, 3 illus.

Manufacture

New Production Lines for Aircraft Engines. R. F. Gagg. An explanation of the four general methods used by aircraft engine builders in increasing output to meet the needs of national defense. All these have the common objective of speeding up production without sacrificing quality. The means outlined for accomplishing this includes the multiplication of existing units, expansion of the plant as a single process by enlarging each

operation, the creation of subsidiary factories and the provision for licencees who already have similar equipment. Figures on the actual increase in engine production which have resulted from improvement in machinery and planning are provided. *Mechanical Engineering*, March 1941, pages 177—179, 3 illus.

Douglas "Streamlines" Production. Plan of the Douglas assembly line method for the mass production of military aircraft. Plant layout of production flow is shown and described, and many of the problems which had to be overcome are discussed. It is stated that automobile plant engineers have been sent out from Detroit to study the Douglas methods. *Commercial Aviation*, February 1941, pages 47, 48, 56, 3 illus.

Manufacturers of Aircraft. An alphebetical list of aircraft manufacturers, giving their addresses and listing key personnel. *Aero Digest*, March 1941, pages 118, 122, 126.

Vega Completes $3,500,000 Plant. History and description of the new plant of the Vega Airplane Co., a subsidiary of the Lockheed Aircraft Corp. The factory last year had 600 employees, 170,000 square feet of floor space and one experimental airplane. Now, with its new factory, Vega boasts 4,500 workers, 1,289,901 sq.ft. of space, is producing three types of aircraft and has a backlog of $75,000,000. The eight buildings which make up the new plant incorporate the latest in construction, lighting and industrial comfort. *Aero Digest*, March 1941, pages 80, 84, 5 illus.

Designing for Machinability. James E. Thompson. The first in a series of articles on designing machined aircraft parts with a view to avoiding, wherever possible, difficulty in operation. The writer first discusses tolerance and the side on which the greatest error can be allowed. In actual machining, the processes of drilling, reaming, spotfacing, counter-boring and threading and their design considerations are discussed. *Aero Digest*, March 1941, pages 230, 232, 234, 236 and 271, 6 illus.

The North American Way. The problems of aircraft design and production, told in terms of production sequence and methods at North American. The story of the design and construction of the test model or prototype of the new North American Mustang, a fighter being produced for the British is outlined, as well as some of the assembly and sub-assembly processes worked out by North American to speed production. It is shown that much of the advance in production methods at North American has been the work of J. H. (Dutch) Kindelberger, former chief engineer for Donald Douglas, now executive head of North American. Of especial interest are some of the comparisons in man-hour requirements drawn between aircraft and automobile fabrication. *Fortune*, March 1941, pages 99–103, 198–204, 14 illus.

Bomber—Night Fighter, The Bristol Bolingbroke Is Made in Canada. Visit to the Fairchild Aircraft plant in Canada where the Bristol Bolingbroke is being produced. Production problems caused by the rapid expansion of plant and personnel during the past year, are described. It is stated that many women are being trained in aircraft fabrication and assembly work. A description of the Bolingbroke is also included. *Canadian Aviation*, February 1941, pages 15–17, 36, 8 illus.

Planes, Props and Power for 1941. A. B. Wescott. A survey of expansion by the various divisions of the Curtiss Wright Corporation, including descriptions of new factories recently completed, under construction and projected. Products, capacity and size of new and expanded plants are given. *Western Flying*, February 1941, pages 36–38, 48, 49, 17 illus.

Bolingbroke Production System Reveals Conquest of Handicaps. Eric Crawford. More details of the production sequence used in assembling the Bristol Bolingbroke. *Canadian Aviation*, February 1941, pages 37, 39, 41, 43, 48, 7 illus.

Shoeing the Eagle's Claws. C. W. Seiberling. Activities of the Rubber Industry in aircraft accessory production and development. The manufacture of dirigibles for the Navy is also mentioned. *National Aeronautics*, March 1941, pages 17, 18, 6 illus.

Long-Range Planning Forestalled Gyro Instrument "Bottleneck." Preston R. Bassett. Description of the controlled expansion methods used by Sperry to insure the precision and quality of their products despite a rapid increase of five hundred per cent in production. This was accomplished by careful development of sub-contractors on parts, and long-range planning for rapid expansion of their assembly and test operations in their own plant. *Commercial Aviation*, February 1941, pages 54, 56, 3 illus.

Stainless Steel Fabrication. Frank M. Smith. Suggestions for proper forming, spot welding, and elimination of "tin-panning" flat surface noises in the fabrication of high tensile stainless steels. *Aviation*, March 1941, page 52, 7 illus.

Applying Automotive Methods to Aircraft Production. Don R. Berlin and Peter F. Rossmann. Part 2 of an article dealing with production planning and factors to be considered in achieving production efficiency. Tool engineering, cost analysis and production control are briefly discussed. *Aviation*, March 1941, pages 46, 47, 122, 5 illus.

Track Assembly of Trainers. A picture survey of the track method of straightline production employed in the building of the De Havilland Tiger Moth. The photographs indicate that the fuselage jigs are mounted onto wheeled cars. These move along a track from one stage to the other, until the unit is completed, and is ready for complete assembly. *Flight*, January 23, 1941, page f, 4 illus.

The Design of Jigs for Metal Aeroplanes. F. Griebsch. The strength and arrangement problems for large jigs were, in the main, solved at the time of the development of all-metal aircraft construction. Looking back, the problem can be clearly defined. In recent times, jig design has been effected by increased production and the standardization which became necessary. The basic construction, the loads which occur, and the question of materials, are discussed in the light of available material, and from this, guiding principles have been derived for future development.

The basic framework of the large jigs is often made with tubular construction both for rigidity and mobility. The possibility of adjustment by ring clamps or bolts appears practicable in series production. Other phases of modern jig construction for production adaptability are also discussed. *Aircraft Engineering*, January 1941, pages 27, 28, 30, 10 illus.

Plastic Planes Are Next. A. W. Bernsohn. An explanation of why plywood fell into disrepute as an aircraft material in the years that followed the first World War, and how the use of plastic bonding agents and molded structures are bringing plywood back as a first rate aircraft building stock. The processes devised by V. E. Clark, Gene Vidal, Hughes Aircraft, Timm Aircraft, and the Haskelite Corp. for making molded airplanes of plasticized wood are explained. *Flying and Popular Aviation*, March 1941, pages 24, 25, 62, 64, 3 illus.

Radiant Heat as a Drying Agent. Batteries of infra-red heat-reflecting lamps save time and heat-loss in drying duco, varnish or lacquered finish, according to this description of their many uses. Several suggestions are made for their application to aircraft manufacture. *Commercial Aviation*, February 1941, pages 50, 52, 74, 6 illus.

Materials

Plastics in Aircraft Construction. Webster H. Francis. A study of the use of contour-molded plywood utilizing synthetic resins as an adhesive or bonding agent. This article points out the relative advantages and drawbacks of the thermoplastic and thermosetting synthetic adhesives, indicating some of their present uses and outlining some of the future research which must be done on the particular material. *Aero Digest*, March 1941, pages 238, 240, 272, 4 illus.

Aircraft Plywood and Adhesives. Thomas D. Perry. A study of the use of modern synthetic adhesives as bonding agents for aircraft plywood. Widely used as an aircraft material during the first World War, plywood fell into disuse due to the organic adhesive's inability to resist fungus, sun, rain and extreme cold. The new synthetic resin adhesives have overcome these objections, and new methods, of contouring and molding using a form and a rubber bag, give the aircraft components thus built, great strength. Characteristics of the new materials and methods by which they are applied to aircraft construction are described in this paper. *Journal of the Aeronautical Sciences*, March 1941, pages 204–216, 6 illus.

German Aeronautical Materials and Testing Machines. H. J. A. Wilson. German aircraft manufacturers have eliminated duplicate effort in material testing by setting up an inspection department for the industry. Members of the department supervise not only the finished product but also its production. In this survey of aircraft metals and testing machines, the writer describes some of the more commonly used steels and non-ferrous alloys. Some of these have been developed to utilize more raw materials of which Germany has an ample supply. Drawings of machines for testing materials are also shown. *Aeronautics*, February 1941, pages 50–52, 9 illus.

Rubbers, Natural and Synthetic. J. W. Schade. The meaning of the word rubber has changed since the advent of synthetic materials similar to the natural product. It is now used to designate a class of flexible, elastic materials rather than a particular hydrocarbon product of natural origin. The synthetics are classified into five types. The mechanical properties of all types are determined not by the kind of chemical elements composing them but rather by the arrangement of these elements, the size of the molecules and by structures produced by vulcanization. All rubbers are modified by addition of other materials to fit them for a variety of uses. Differences in chemical composition and in the properties of natural and synthetic rubbers are shown in tabular form.

Mechanically, natural rubber is not surpassed by any synthetic rubber. However, in resistance to swelling by organic liquids, such as gasoline and oils, and to deterioration by sunlight or oxidizing agents synthetic rubbers have been found superior. These characteristics directed commercial applications to those fields where these properties are particularly needed.

Comparison of values of the various rubbers is constantly being made by technologists in the rubber industry. Therefore, when acceptance tests to insure suitability of products for particular uses are specified, it is advantageous to permit these men to select the materials which best meet the requirements. *Journal of the Aeronautical Sciences*, March 1941, pages 177–182.

Beryllium Plans a Jump from Corset Stays to Airplanes. The history of beryllium, with figures on its new alloy, Beralite, which may add payload and increased performance to the aircraft of the future. *U.S. Air Services*. March 1941, page 20.

Effect of Low Temperature on the Properties of Aircraft Metals. Samuel J. Rosenberg. The effect of subzero temperatures down to −78°C. upon the tensile properties, hardness and impact resistance of metals commonly used in aircraft construction was determined. Three general groups, ferratic steel, austentic stainless and nickel alloys and light aluminum and magnesium base alloys were investigated. None of these properties appeared to be adversely affected by low temperatures with the exception of the ferratic steel, whose impact resistance seemed to be lowered by extreme cold. *Journal of Research of the Bureau of Standards*, December 1940, pages 673–701, 25 illus.

Medicine

New Tests for Fliers. James Nevin Miller. A description of some of the newest tests given cadets at Randolph Field to determine their fitness to fly. Serial reaction, coordination and optical tests, examinations to show resistance to reduce pressure and oxygen want as well as thorough probing for color-blindness or other physical defects is outlined. *Science Digest*, April 1941, pages 79–81.

The Flight Surgeon. Meredith Johnson. Description of the qualities, duties, and many problems of the flight surgeon. He must be part flyer, doctor, psychologist, trainer, engineer, and philosopher. He must be able to select the right men for flying and keep them in the best of mental and physical condition. It is said that a pilot who is as much as fifteen per cent below perfect form is a menace in the air. Problems of high speed maneuvers and high altitude flight are also discussed. *Commercial Aviation*, February 1941, pages 21, 36, 1 illus.

Physiological and Psychological Characteristics of Successful Pilots. Col. A. D. Tuttle, M.D. An analysis of a cross section of 200 air line pilots from which it is hoped to obtain data to serve as a check on present pilot tests, to determine if certain characteristics exist, to seek evidence of acclimatization or indications of premature aging. The writer describes the subjects, the tests, and an outline of the results. In his discussion he emphasizes the fact that this study can only serve as a preliminary report to be followed by more comprehensive investigations of larger groups in the future. *The Military Surgeon*, March 1941, pages 227–237.

Airplane Ambulance Evacuation. Lt. Col. David N. W. Grant. Presentation and discussion of a plan for a proposed air ambulance unit for evacuation and transport of sick and wounded. Squadrons of the unit would be made up of twin-engined transports for distance and mass evacuation operating from relatively large fields twenty to fifty miles behind the front, and single-engined ambulance aircraft which would shuttle between such base fields and the front. The latter would have a high angle of climb, short take-off, slow landing speed and maneuverability. *The Military Surgeon*, March 1941, pages 238–243.

Meterology

Influence of the Cascade and Rocky Mountains on the Temperature During the Westward Spread of Polar Air. Phil E. Church and T. Edward Stephens. A study on the effect western mountain ranges on polar air masses traveling from north central Canada southwest to the Pacific Northwest. The writers analyze the dam or barrier effect of the Rocky, Bitterroot, Cascade and Olympic ranges and conclude that they act as a barrier to lower level stable cold air, and permit only the potentially warmer air above the altitude of the mountain tops to flow westward. *Bulletin of the American Meteorological Society*, January 1941, pages 25–30, 4 illus.

Construction and Use of a Slide Rule for Determining 10,000-Foot Pressure. J. R. Fulks and R. A. Dightman. Description of the method used to construct a slide rule for finding pressure at the 10,000 foot level from surface pressure readings. *Bulletin of the American Meteorological Society*, January 1941, pages 21–24, 1 illus.

Weather Forecasting. Brief discussion of clouds and the kinds of weather often heralded by their appearance. *Aeronautics*, February 1941, page 84.

Kampf Gegen die Vereisung im Luftkrieg (Prevention of Ice Formation During Aerial Warfare). Karl Anders. Problems of military flying in zero and below zero (centigrade) temperatures. Water which is in motion in one way or another (rivers, ponds, the Baltic, etc.) freezes at 0°C.; but there are cases where still water remains in its liquid state, even below the freezing point; this is called "subcooled" water. However, the slightest vibration transforms such water suddenly into ice whereby strong expansion forces are set free, as it is well known that freezing water expands.

Ice formation on airplanes is a similar phenomenon. There is always a certain percentage of humidity in the atmosphere ranging in size from tiny droplets of a diameter of 0.001 millimeter to that of rain drops. Very often these droplets are subcooled. The high speed airplane brings them into rapid motion, and the propeller whirls them around, while the fuselage, the wings, and the tail group push them suddenly aside. The vibration due to this motion turns these droplets at once into ice, which suddenly forms on every part of the airplane it touches. This is called a "flash" ice formation, and is considered the most dangerous type. Within a few seconds the airworthiness of the airplane is changed radically. Lift decreases, air resistance increases, causing loss of altitude. The airplane no longer answers to control surface movement.

Ice forms mainly on the leading edges of airfoil sections. It therefore has very serious effects on propeller efficiency as propeller thrust is very much decreased. Due to the high number of revolutions the ice is thrown off, but not uniformly, which brings the propeller out of balance. This creates vibration which may become so strong that the engine is torn from its mount. Further disadvantages may be observed when ice forms on the leading edge of the wing, as this is the spot where the air flow is divided to flow in streamlines above and below the airfoil. Light formation of ice is rather harmless in this case, but if it is heavy which in almost all the cases means non-uniform, the airflow tears, and is transformed into parasitic vortices. At the same time ice forms on the slots and bearings of the control surfaces, rendering them unmanageable. In this case a crash is almost certain. The author finally describes preventative measures taken against ice formation, and various deicers. *Der Deutsche Sportflieger*, January 1941, page 6.

The Daytime Photoelectric Measurement of Cloud Heights. Maurice K. Laufer and Laurence W. Foskett. A photoelectric detector is used in conjunction with a modulated beam of light for the measurement by triangulation of the height of clouds during the daytime. An a.c. operated mercury-arc lamp is used to obtain the modulated beam. An electronic "synchronous switch" is used to eliminate the effect of the varying background brightness of the clouds. The shot noise of the phototube resulting from the relatively high brightness of clouds during the daytime limits the detection. Dark overcast clouds at an elevation of 9,000 feet have been detected. *Journal of the Aeronautical Sciences*, March 1941, pages 183–187.

A Method for the Correction of 3-hour Pressure Tendencies in Ship Weather Reports. Dwight L. Randall. Formula and sequence for computing the correction of 3-hour pressure tendencies from a moving base or station such as a ship. *Bulletin of the American Meteorological Society*, January 1941, pages 14–16.

Air Movements and Weather in the Mauna Kea—Mauna Loa Saddle, Hawaii. W. E. Powers and C. K. Wentworth. Description of topography of areas surrounding Hawaii's two large volcanoes, and its effect on the weather of the island. *Bulletin of the American Meteorological Society*, January 1941, pages 6–13, 6 illus.

Vorticity Analysis of a Thunderstorm Situation. M. Neiburger. Further development of investigations into a newly-defined conservative air mass property called potential vorticity. Method of computing potential vorticity together with several charts showing potential vorticity fields, are given. *Bulletin of the American Meteorological Society*, January 1941, pages 1–5, 5 illus.

Weather Data "Bank." William Stark. For the last five years, a group of W.P.A. workers have been compiling weather data at a New Orleans project. The project has been developed to such a degree of efficiency that specific requests for information on such things as average prevailing winds, used in orientating runways, average velocity, precipitation or fog conditions can be provided with six hours of the time the request is received. *Western Flying*, February 1941, pages 40, 43, 2 illus.

Military Aviation

America's Air Hitting Power. C. B. Allen. A comparison between European and American defense strategy, indicating the Western Hemisphere defense needs long range aircraft which can strike at an invader before enemy forces reach shore. Figures on present air strength are given. *Popular Science*, April 1940, pages 113–117, 4 illus.

Fighter Manoeuver. W. E. Hick. The writer suggests that fighter maneuverability could be improved with properly designed air brakes, and discusses their use in fast sharp turns. *Aeronautics*, February 1941, pages 41, 42, 2 illus.

The Balloon Command. Pictures and captions of the R.A.F. barrage balloon work, together with notice of the appointment of Air Marshal E. L. Gossage as Air Officer Commander-in-Chief, Balloon Command. *Aeronautics*, February 1941, page 40, 3 illus.

The Air Force and the Army. Outline of development of the R.A.F. from a Corps of the Army to its present independent form. The newly created Army Cooperation Command is also described and some of the special training problems involved in its work with the Army, are discussed. *Aeronautics*, February 1941, pages 36, 37.

What U.S. Aid Means. Discussion of the close cooperation between British and American aircraft industries, and what the great potential manufacturing capacity of U.S. aircraft plants will mean to British war effort. *Aeronautics*, February 1941, pages 38, 39, 4 illus.

Overhead Attacks on Convoys. Analysis of problems involved in attack and defense of convoys. German methods of attack are described together with several British defensive tactics. *Aeronautics*, February 1941, page 83.

Bombs on Germany. Description of methods used by the R.A.F. in bombing German military targets. Raids are preceded by careful photographic reconnaissance so that bomber navigators can be given detailed charts of the countryside around the target and a scale plan or picture of the target itself. After the raid, bomber crews are carefully questioned to verify that there is no mistake about their having attacked the correct target. *Neptune*, pages 8–11, 7 illus.

Bomber und Stukas (Bombers and Dive Bombers). Ernst Wyss. The writer, a Swiss captain, describes in detail the use and effects of these two bomber types. He draws his conclusions from data gathered so far during the present war, and agrees with Marshal Petain who declared some years ago that the purpose of modern war is no longer the destruction of armies, but the destruction of entire countries. *Schweizer Aero-Revue*, December 1940, pages 391–396.

A Day Out with the Americans. English news observer's account of a visit to a large receiving depot where American military aircraft are being assembled. The station itself is described together with the way in which airplanes are crated, ready for quick assembly. It is stated that British pilots have affectionately dubbed the Brewster and Grumman fighters the "Peanut Specials." While they are shipboard fighters it is said that they may be used to keep the Channel clear of Ju-87 dive-bombers. A mock combat between a Hurricane and a Curtiss P-40 is described in which the Hurricane, whose age and ancient design is stressed by the writer, out-performs the Curtiss. (*Ed. note*: The American correspondent for *Collier's* saw the same dog-fight and said it was just the other way around, which probably means they were evenly matched.) The Douglas D.B. 7, Lockheed Hudson, and Martin 167 are also mentioned. *Flight*, February 13, 1941, pages 140, 141, 5 illus.

The British Bombing Campaign. Description of the general plans and objectives of the British Bombing Command. Considerations which weigh in the planning of an attack; reports and questioning of air crews; sifting reports; and choosing the target, are outlined in brief. *Flight*, February 13, 1941, pages 134, 139.

U.S. Prepares Its Air Defense. Pictures and brief descriptive captions about the air defense warning system in which civilian observers cooperated with military air observers to report the approach and location of "enemy" bombers. *Aviation*, March 1941, pages 34, 35, 9 illus.

Efficiency Report on the German Air Force. Lt. Col. W. Lockwood Marsh. The editor of the British publication *Aircraft Engineering* gives his evaluation of the Luftwaffe and the effect of attacks on England thus far. It is stated that the Germans have found that raids on well defended military objectives in England are a very different operation from those made against relatively undefended France and the Low Countries. The writer also states that German pilots have shown no great determination in pressing home attacks in the face of strong opposition. Ineffectiveness of dive-bombing raids on heavily defended convoys, is shown as well as considerable disparity between German reports on aircraft raids, and proved facts. The superiority of British fighters in performance and fire-power is also discussed. *Aviation*, March 1941, pages 30, 31, 120, 3 illus.

Toward the Stratosphere. Discussion of the probability of sub-stratosphere operations for military aircraft being the next step in air warfare. Problems of pressurized cabins and engine superchargers are mentioned, together with the fact that Germany may be ahead of England in supercharger research. *Flight*, January 16, 1941, pages 43, 44.

Ground Maintenance. A flight-sergeant in charge of the maintenance crews of a Hurricane flight in a Fighter Squadron 249 tells of the work, worry and friendly rivalry among his men. Each crew is in charge of one fighter and treat their charges like thoroughbred racing horses. It is said that the entire squadron can be refueled and rearmed in only $8^1/_2$ minutes. Servicing and repair operations are described together with typical daily routine of the R.A.F. ground crews. *Flight*, January 16, 1941, pages a-c, 7 illus.

The Low Countries and France. Captain Norman Macmillan. Outline of air tactics over Holland and Belgium following the German invasion. It is said that the Luftwaffe had been thoroughly trained in the kind of attack used, while the Allies had neither the airplanes or proper defense training to meet it. The first effective defensive work was done by the British fighter squadrons over Dunkirk. The need for a unified air force with unity of command is also explained. *Flight*, February 6, 1941, pages e-113.

Dutch Airmen in Britain. Henry Baerlein. Account of a visit to an R.A.F. station manned by members of the Netherlands Air Force. Included are stories of how many of these Dutch airmen made their way to England, by air, by boat, and one by foot from Rotterdam to Lisbon before he embarked for his destination. One group sailed a derelict Danish tramp, laden with iron ore across from the Belgian coast. The Dutch are enthusiastic about British military aircraft, and the British apparently are just as enthusiastic about the Dutch airmen. *Flight*, February 6, 1941, pages a–c, 4 illus.

A Portfolio of U.S. Military Airplanes. Description of the functions of various types of military aircraft, with color photographs of some of the newer airplanes of each type. Included are the Bell, Brewster, Curtiss, Lockheed, Grumman, and Vought-Sikorsky fighters, Martin, Boeing, Douglas and Consolidated bombers, the Curtiss Navy dive-bomber, and Ryan, Stearman, and North American training aircraft. *Fortune*, March 1941, pages 70–74, 19 illus.

A Tactical Flying Primer. Series of pictures with descriptive material showing tactical formations of fighters and bombers together with the operations of level bombing, attack bombing, dive bombing and striking with aerial torpedoes. Also shown are the arcs of fire for both bombers and fighters, a fighter element attacking a bomber, as well as details of machine gun and cannon mounting in aircraft and the placement of protective armor on combat airplanes. *Fortune*, March 1941, pages 66–69, 22 illus.

On Being an Irk. Michael Gray. A British aircraftsman or ground maintenance man tells of his training, and of the daily life of the ground crews. *Flight*, February 7, 1941, pages 174, 176, 4 illus.

Canadian Fighter Pilots Score. Brief history of the "All-Canadians," a Canadian fighter squadron headed by D. R. S. Bader, famous legless pilot. Their score is more than one hundred enemy airplanes, and they have seen action in France, at Dunkirk, and over London. *Canadian Aviation*, February 1941, pages 30, 71, 1 illus.

What Has America Learned from the War? Carl Dreher. A survey of the changes in tactics and equipment made necessary by observation of what is happening in the European war. Changes in power, armament and armor, the addition of power turrets, self-sealing tanks, building of "blackout" type of aircraft factories are among the alterations in defense ideas which have already resulted from study of the present conflict. *Popular Science*, April 1941, pages 54–59, 220, 15 illus.

"Rontgen Ray" Bomber. A discussion of the "Wolkenrontger," a device supposed to have been invented by Professor Doctor Leo Ubbelohde of the Berlin Technical High School. This device, said to resemble the apparatus used in infrared photography, would permit pilots to find their way in dense fog. *The Aeroplane*, February 14, 1941, page 203.

Bomber to Britain. James L. H. Peck. A reporter's account of the flight of six Lockheed Hudsons across the North Atlantic. Wind, icing conditions, and finally the Nazis, are encountered. Though written for the non-technical reader, the account

abounds in details of plane operation under various conditions, and describes non-radio methods of flight control. *Harper's Magazine*, March 1940, pages 347–358.

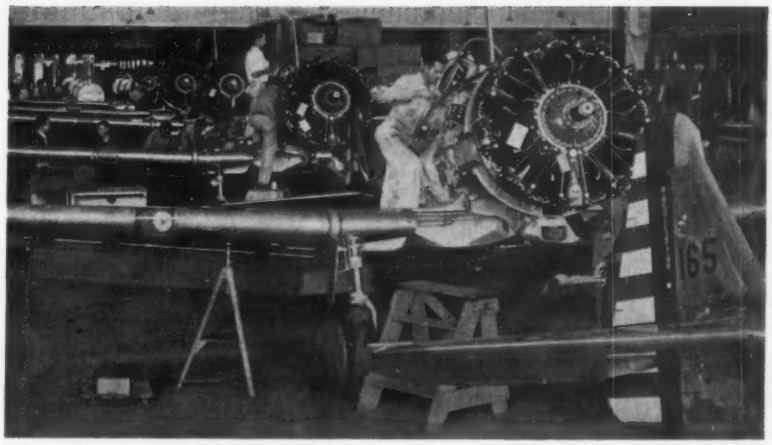
Old Glory. A report on American fighting craft now in service with the R.A.F. The Curtiss Mohawk and Tomahawk, the Douglas DB-7A, Brewster 339 and the Grumman G-36a have had enough flying time in actual combat for the British pilots to have formed opinions on their merits. This article is a report on their performance and a cross-section of the comments on the virtues and weaknesses of the American airplanes in actual service against the Luftwaffe. *The Aeroplane*, February 14, 1941 pages 205–207, 7 illus.

From U.S.A. to R.A.F. A table of the airplanes supplied by the United States aircraft industry to the R.A.F. Fighter, Bomber, Coastal and Training Commands, the Fleet Air Arm and various civil auxiliaries, giving the builder's name, U.S. designation, British designation, power plant, top speed, age of design and position of British order. Fifty-five types are tabulated. Photographs of many of these airplanes are also provided. *The Aeroplane*, January 17, 1941, pages 79–87, 35 illus.

Miscellaneous

Air History in the Making. C. G. Grey. Current anecdotes about the R.A.F. and a suggestion that American fighter aircraft be shipped across the Pacific to Suez and flown to the scene of action in both the eastern and western Mediterranean. This would save in shipping especially through the danger zones of the Mediterranean. The writer states that the use of American fighters on the African front would enable England to retain her superior fighters for her own defense. The writer "also wonders whether the clever engine designers in the United States have done anything serious about the direct injection of petrol." *The Aeroplane*, January 24, 1941, pages 122, 123, 3 illus.

I Learned about Flying from That. Captain Fred Smith. The writer, now an airline captain, points out the danger in flying into another airplane's slipstream. To prove his point, he relates an experience while flying with the U.S. Marines at the National Air Races in Cleveland. The squadron was performing the "squirrel cage." Turbulent air threw his airplanes and two others into the slipstream of the other craft. The result, in this case was as an inverted spin. Smith, somehow, recovered, but the two other airplanes disintegrated.



North American AT-6A advanced trainers arrive at the final stage on the assembly line at Inglewood, California. This type will be the standard advanced training craft under the expanded U.S. Army operations.

Although their pilots made successful parachute descents, their experience is an object lesson on why one should avoid the wash of other airplanes. *Flying and Popular Aviation*. March 1941, pages 37, 84, 86, 3 illus.

Ninth Annual Meeting of the Institute of the Aeronautical Sciences. Review of proceedings at the Honors Night Dinner, on January 28th, and digests of the following papers: Air-Cooled vs. Liquid-Cooled Aircraft, by John G. Lee, United Aircraft Corp.; Propeller Design Problems of High Speed Airplanes, by H. B. Dickenson, Lockheed Aircraft Corp.; Aircraft Plywood and Adhesives, by T. D. Perry, Resinous Products and Chemical Co.; The Omnidirectional Radio Range, by David G. C. Luck, R.C.A. Mfg. Co. *Aviation*, March 1941, pages 44, 45, 132, 134, 19 illus. (See also March issue of the *Aeronautical Review*.)

Intelligent Vigilance Is Check on Saboteur. Description of methods used in aircraft sabotage. These include slow fires, cable or bolt cuts, fuel stoppage, acids and caustics, and explosives. Some of the precautions taken by Canadian plants are outlined. *Canadian Aviation*, February 1941, pages 44, 48.

Wilful Waste. C. G. Grey. Discussion of the recent accidents on American domestic air lines following the abolition of the independent Air Safety Board. The writer believes that all facts and findings about accidents should be published. He also outlines reasons why he believes that tricycle landing gear will not prove practicable in England. *The Aeroplane*, February 7, 1941, pages 177, 178, 3 illus.

U.S. Air Industry. A distorted outline map showing the relative importance of different parts of the country in aircraft production, together with present capacity and planned expansion of various plants. *Fortune*, March 1941 pages 84, 85, 1 illus.

City of the Angels. Analysis of the effect the aviation boom has had on the community of Los Angeles. It is said that Los Angeles took the aviation backlog increases of 1939 and even of 1940 in its stride. But the increase from 350 millions in 1940 to over a billion in 1941 has made it a "boom town." Included are descriptions of some of the new aircraft plants, plant executives and personnel as well as some of the problems which the tremendous expansion has brought both the industry and community. *Fortune*, March 1941, pages 90–95, 174, 179–182, 23 illus.

Model Airplanes

A Record Holding National Winner. Bill Redecker. Description, plans and constructional directions for the *Demon*, Ohlsson 23 or Baby Cyclone powered Class B and C gasoline-engined model. This type established a nation three-flight average record for Class B models of 9 minutes 20.3 seconds at the 1940 National Meet. *Model Airplane News*, March 1941, pages 16–19, 54, 5 illus.

Naval Aviation

On Guard! Harold Keen. An account of the manner in which the U.S. Navy's patrol bombers have placed the real outpost of the United States' safety zone at 1,700 miles from her land bases. The advantages which the newly acquired naval bases

will give to the defense plan are indicated. *Flying and Popular Aviation*. March 1941, pages 40, 41, 70, 72, 3 illus.

Navigation

Astronomical Avigation. Frederick Harrison Tregenza. Third in a series on celestial navigation. This one deals with the horizon, zenith and nadir, altitude and azimuth, circles of position, lines of position and lines of position computed from a dead reckoning position. *Commercial Aviation*, February 1941, pages 31–33, 38, 4 illus.

Winged Classrooms for Navigators. A description of the courses in aerial navigation given by experts of Pan American Airways to cadets of the U.S. Army Air Corps. These men are being trained to navigate long range bomber and patrol craft for hemisphere defense. *Popular Mechanics*, April 1941, pages 526, 527, 122A, 6 illus.

Pre-Computed Altitudes. Warren C. Youngclaus. An explanation of the manner in which the navigational principle of determining position by sighting celestial bodies from a precomputed altitude curve, may be applied to conventional cross-country flying. *Aero Digest*, March 1941, pages 246, 252, 3 illus.

Parachutes

Soldiers with Wings. An explanation of the usefulness of parachute troops in modern warfare and a description of the selection, training and equipment of parachute infantry in the United States. *Popular Mechanics*, pages 508–511, 155A, 11 illus.

Getting the Jump on Forest Fires. Ivy M. Howard. One of the latest peaceful applications of the parachute encirclement tactic is the system developed by the U.S. Forest Service for dropping a parachute jumper onto the scene of a fire within a few minutes of the first sighting of smoke. This enables them to put out the fire before it has a chance to grow to major proportions. To effect safe landings in heavily wooded areas, a special suit and spotting equipment, as well as a lightweight radio transever has been devised. The method of locating fires, dispatching the airplane and jumper and some of the observations made during the first year of parachute fire-fighting are given. *Airlanes*, February 1941, pages 7, 17, 5 illus.

School for Sky Soldiers. Walter Holbrook. A description of the course of training through which specially selected Army volunteers are put before they are assigned to the new parachute battalion. The requirements for assignment to this branch of service are outlined. *Popular Science*, April 1941, pages 88–94, 21 illus.

Personalities

Sir Hugh Dowding Is Interesting at His First Press Conference in Washington. Account of the first press conference in which the writer states that too much patience was shown as inconsiderate a group of press photographers as ever gathered in one place. With flash bulbs exploding in his face four at a time, the British Air Marshal quietly explained that his services and experience are to be made available to American aircraft manufacturers. His purpose is to assist in the standardization of military aircraft to fit both British and American military requirements, insofar as such standardization is possible. *U.S. Air Services*, February 1941, pages 32, 38.

Who's Who in OPM, Aircraft Section. Notes on the experience and background of key men in the Aircraft Section of Office of Production Management. Included are Merrill C. Meigs, Chief, T. P. Wright, Assistant Chief, A. E. Lombard, Jr., Chief of the Production Planning Unit, A. J. Brandt, Chief of the Manufacturing Unit, Major E. M. Powers, Chief of the Engineering Unit, A. O. Pierrot, Latin America Contact Officer, C. E. Stryker, in charge of standardization, Kendal Perkins, Chief Airplane Delivery Program, R. E. Palmer, in charge of the propeller division, R. E. Lees, Chief of Aircraft Production Analysis, and H. R. Boyer, Chief of Facilities. *Aviation*, March 1941, pages 32, 33, 138, 3 illus.

Earl Schaefer. Intimate facts about J. Earl Schaefer, Vice-President of Boeing Aircraft's Stearman plant at Wichita, Kansas. *Western Flying*, February 1941, page 39, 1 illus.

LaMotte T. Cohu. Sidelights on the personality of LaMotte T. Cohu, Chairman of the Board of Directors of Northrop Aircraft, Inc., and an outline of his aviation career. *U.S. Air Services*. March 1941, page 28.

Photography

Build an Aerial Camera. S. A. Grugan. A detailed description of the method by which the writer built an aerial camera out of a three dollar second-hand view camera, hardwood planking, flatiron handles and miscellaneous inexpensive odds and ends. The selection of a lens, shutter, films and filters as well as methods of making and marketing pictures is outlined. *Flying and Popular Aviation*, March 1941, pages 48–50, 89, 5 illus.

Sky Mapping's Defense Role. Birt Darling. An account of some of the modern aerial camera mapping survey work being done for various Government departments by the Abrams Aerial Survey Corporation. Included is a description of special equipment for use in mapping contour lines and determining elevation. *Western Flying*, March 1941, pages 21, 32, 2 illus.

Private Flying

Dear Sir:—(Letter received by the Piper Aircraft Corporation.) An amusing letter from a fifty-year-old owner of a Cub who had just failed in his C.A.A. ground school examination for a private pilot's license. His comments on the "trick" questions are not without justification, and his point that section and quarter section lines of farm boundaries run parallel to longitude meridians and latitude parallels is a practical suggestion for cross-country flying not found in C.A.A. manuals. *The Sportsman Pilot*, February 15, 1941, pages 11, 40, 41.

Flight Test Your Own Airplane. Brian Sparks. Description of ways and means to measure the performance of your airplane. The method of calibrating the airspeed indicator is outlined in detail. *The Sportsman Pilot*, February 15, 1941, pages 15, 34, 36, 38, 3 illus.

Planning the Future of Civil Flying. M. de Bunsen. Presentation of a plan for organizing and operating private flying clubs to take over training airplanes and military flying fields in England after the war. Several operating budgets are outlined. *Aeronautics*, February 1941, pages 47, 48.

The Largest Service Depot East of the Rockies. Milton F. Baldwin. Description of the Southwest Airmotive Company's plant and hangar at Love Field, Dallas, Texas. *Southern Flight*, February 1941, pages 8, 9, 11 illus.

"Home on the Range"—In an Ercoupe. Selby Calkins. Account of a visit to the C Bar G cattle ranch by Ercoupe. The writer also interviews Henry A. Berliner, President of the Engineering & Research Corp. makers of the all-metal Ercoupe. Material shortages have delayed deliveries somewhat, and it is said that the company is thinking of substituting plastic-bonded plywood in the fuselage construction. A larger model with greater horsepower and longer range is also being considered. However no changes in the present model

will be made for some time to come. The writer gives his impressions of flight characteristics of the Ercoupe and describes the C Bar G as a working ranch. The ranch maintains its private landing field, and is a popular stopover point for sportsman flyers in California. *Western Flying*, March 1941, pages 26–28, 37, 5 illus.

Flying for Everyone. Wolfgang Langewiesche. Condensed from Chapter three of the writer's book "Lightplane Flying," which deals with flying clubs and club ownership of light airplanes. Problems of membership, costs, plan of operation, rules are discussed and a sample constitution is given in full. *Western Flying*, March 1941, pages 22–24, 34, 5 illus.

Aviation Unlimited. Robert H. Hinkley. A survey of the progress made in private flying and non-commercial airplanes in recent years, and a forecast of their place in the future. *Popular Mechanics*, April 1941, 481–483, 144A, 6 illus.

NC 26641 Heading South. Betsy Ross. An account of a woman flyer's trip to Florida, as part of the light airplane cavalcade to the Miami races. *National Aeronautics*, March 1941, page 9, 1 illus.

Flying Stamps. Edward Clark. Sam Fletcher, Grand Rapids haberdasher and pilot, devised a plan for giving away stamps, redeemable in flying instruction, with every purchase. Neighboring merchants, seeing that it was a good idea, joined Sam. This is an account of how a private pilot's plan grew into the Flying League of America, with over 300,000 persons in the Grand Rapids-Cleveland area saving its stamps. *Flying and Popular Aviation*, March 1941, pages 38, 39, 3 illus.

We Buy a Used Plane. Jack Rowley. A typical private pilot, after determining that it was cheaper and more convenient to buy a used airplane than to rent one, searched the market for a suitable craft. The article contains most of the information the writer collected on how to judge the value of a used airplane before purchasing it. *Flying and Popular Aviation*, March 1941, pages 29, 30, 2 illus.

Propellers

Airscrew Balancing. J. Lockwood Taylor. The increasing use of variable-pitch propellers has changed the comparatively simple method of static-balancing propellers on a knife edge into the complicated one necessary for securing dynamic balance. It necessitates balancing each blade about all three axes, as well as establishing dynamic balance when the complete unit is finally assembled. The procedure applied in getting this balance in two, three and four-bladed variable-pitch propellers is described. *Flight*, January 30, 1941, pages 98, 99.

Balancing Aircraft Propellers. Murray C. Beebe, Jr. The second in a series of articles on the problems involved in measuring mass and aerodynamic unbalance in a propeller. This installment explains the functioning of the Dynetric electrical system used as factory equipment in measuring mass unbalance. *Aero Digest*, March 1941, pages 256, 258, 260, 7 illus.

Eliminating Propeller Failures. Erle Martin. Description of the research methods developed and used by the Hamilton Standard Propeller Division, United Aircraft Corp., in measuring propeller vibration stresses. Test equipment has been refined to such a point that records of stresses at twelve points on the propeller can be made simultaneously. Test apparatus and results are shown and described. *Aviation*, March 1941, pages 40, 41, 118, 120, 7 illus.

Radio

Recent Advancements in Aircraft Radio. W. D. Van Dyke. Description of new radio equipment manufactured by Air Associates which incorporate many of the latest advances in material and accessories. The two-channel, six-frequency aircraft receiver for air line use, the ground station transmitter, the new transever unit for private airplanes and the portable radio range instruction equipment are among the units whose engineering, construction and use are explained. *Aero Digest*, pages 69, 72, 76, 244, 7 illus.

The Private Flyer's Radio Equipment. David S. Little. A survey of some of the essential information which a private pilot should have before he purchases radio equipment for his airplane. The reasons for the three essential qualities a good radio receiver should have, selectivity, sensitivity and proper provision for a satisfactory radio-range antenna, are explained. *Aero Digest*, March 1941, pages 54, 66, 1 illus.

Stress Analysis

The Bent Strut with Variable Cross-Section. Jean Drymeal. A graphical method is developed for solving the problem of the beam with variable section bent by transverse loads and an axial load, the latter being either tensile or compressive. The beam on statically determinate supports in first dealt with successively regarding stress and deformation. A similar procedure is followed for a beam with redundant supports. Finally the case is studied when there is no transverse load at all. *The Journal of the Royal Aeronautical Society*, February 1941, pages 51–66, 13 illus.

Sul Calcolo dei Solidi Cilindrici in Parete Sottile (On Calculation of Thin-Walled Cylinders). P. Cicala. Determination of the relation between stress and deformation of a reinforced cylindrical shell. Development of a method to calculate the forces and deformation on a sheet metal cylinder for various connection and load conditions. *Pubblicazioni del Laboratorio di Aeronautica*, No. 139, June 1940, 20 pages, 4 illus.

La Stabilita Elastica del Cilindro in Parete Sottile (Elastic Stability of a Thin-Walled Cylinder). P. Cicala. For a metal sheet which forms the surface of a cylinder of generic section a fundamental equation is developed to study the stability of the elastic equilibrium. For the circular cylinder a more simplified equation is set up with consideration of the degree of thickness of the wall. The equation is applied to determine the critical load of a panel which is supported at the circumference, and under compression. *Pubblicazioni del Laboratorio di Aeronautica*, No. 137, May 1940, 19 pages.

Indagine Sull'Effetto Irrigidente della Lamiera di Rivetimento Nelle Strutture Alari a Due Longheroni con Cetine e Metodo di Calcolo per Esse (Investigation of the Stiffening Effect of Sheet Metal Covering on Two-Spar Wing Structures with Ribs, and a Method to Calculate this Effect). G. Santangelo. After a brief review of the structure of a two-spar wing with ribs, a method is developed to calculate its torsion. By means of a variable force researches are made of the effect of sheet metal covering on a structure of the above type under torsion, whereby it is assumed that the sheet metal is under diagonal stress. *L'Aerotecnica*, December 1940, pages 901–913.

Warfare

Day Offensive. An account of an experiment in daylight bombing conducted by the Royal Air Force over Pas de Calais. Concentrations of heavy bombers, accompanied by large numbers of escort fighters, bombed and machine gunned airdromes, military installations and surface vessels. The result of this experiment may, according to this article, have a profound effect on air fighting tactics in the future, as it proved that well-

armed, heavily-protected bombers could put hundreds of square miles of occupied France, Belgium and Holland under constant threat of daylight attack. *The Aeroplane*, January 17, 1941, pages 64, 65.

Warriors in Mufti. Both sides of an argument current in England about providing uniforms, discipline and military standing for the Observer Corps. Those who oppose it, claim that this action would virtually conscript these volunteers who watch for enemy aircraft, placing them in the R.A.F. Those who favor uniforms and organization state that under international law, these men, out of uniform, performing military duty, could be considered irregulars and shot if they were captured. *The Aeroplane*, January 31, 1941, page 137.

De Kunst van Camoufleeren (The Art of Camouflage). This article deals with camouflage, its history and its practical application in the present war. Observation from the air is of the greatest value to the belligerents who are making special photographic flights into enemy countries. As the camera picks up much desired information, the main object of the warring nations is to camouflage important points on the ground, especially flying fields. The article describes how this is done. As an example how effectively camouflage is applied, the story is told of a British flyer who took off from a flying field in the morning, and was unable to detect it on his return in the afternoon. *Luchtvaart*, January 7, 1941, pages 12, 13.

Air Strategy—XXXVII: An Analysis. Captain Norman Macmillan. A discussion of the tactical employment of fighters and bombers, indicating the impracticability of long range day raids, or bombing raids of such length as to expose unescorted night bombers to daylight. The failure of the Polish air force to combat the German Luftwaffe and the part of this group in the conquest of Poland is outlined. Some curious phases of German operation, such as the ceaseless reconnaissance over the French Front after the Polish victory is explained. *Flight*, January 23, 1941, pages 69–71.

Air Strategy—XXXVII "Norway." Captain Norman Macmillan. A discussion of the tactical employment of aircraft by the Germans in the Norwegian campaign. The importance of the seizure of airports and landing areas, exploiting to the fullest the political division of the people and the lack of native air strength. The manner in which the Luftwaffe aided in seizing airports, acted as the means of communication which the British were unable to break, reinforced garrisons, assisted mechanized troops and carried men and supplies to strategic spots is described. The German victory in Norway is credited by this article, in a large measure to the establishment of a chain of airports through which constant transportation and communication could be maintained. *Flight*, January 30, 1941, pages 95–97, 1 illus.

Attack on Britain. Captain Norman Macmillan. Further analysis of the mistakes of the Germans in their air tactics over the Low Countries and England following the initial drive to the west. The inferior equipment, training, and morale of the Luftwaffe is attributed by the writer both to Goring, and a difference in German temperament which prefers to fight en masse, with the odds in its favor. *Flight*, February 13, 1941, pages 137–139.

Through Hell on Wings. Composite diary of R.A.F. pilots, "edited" by Keith Ayling. An account of life in the R.A.F. *Liberty*, February 22, 1941, pages 26–28, 30, 31, 1 illus.

The Chances of Invasion. Major F. A. De V. Robertson. Analysis of several methods Hitler may use to invade England. The possibility of the invasion threat or the German troop movements in the Balkans being a feint is discussed as well as strong and weak spots in Hitler's overwater offensive and England's defense preparations. Possible new tactics on the part of the Germans are also described. *Flight*, February 6, 1941, pages 114, 115.

Some Aspects of British Air Strategy. Summary of British air strategy as given by a high-ranking officer of the R.A.F. The writer states that the R.A.F. is not an independent service, any more than the Army or Navy are independent. All three are interdependent. He lists the main objectives of the R.A.F. as (1) to defend the United Kingdom, (2) to collaborate with the Royal Navy in defending sea-borne supplies against surface, submarine or air attack and (3) collaborate with other services in defending overseas territory and naval defense bases. Problems of air fighting over England, France and Belgium, and in the Mediterranean are described together with the objectives of the near future. *Fortune*, March 1941, pages 32, 48, 52.

Battleship or Aircraft Carrier. The old question of airpower versus seapower regarding the arrival of German bombing squadrons in the Mediterranean, is examined once more. The writer believes that the British Navy hopes to cope with bomber attacks in the Mediterranean by means of carrier-based fighters. He points out that if the British can establish fighter bases within range of the Sicilian Channel much of the problem will be solved by fighter patrols. *The Aeroplane*, January 24, 1941, pages 101, 102.

The 71st Week of War in the Air. Two events which may have a bearing on the future course of the War are discussed; the beginning of large scale daylight operations against Germany by R.A.F. bombers escorted by Hawker Hurricane single seaters, refitted for longer cruising duration. The second is the appearance of new R.A.F. equipment, the new Hawker Tornado, a single seater fighter, powered by the Rolls-Royce Vulture engine, the Westland Whirlwind, and the four-engined Short Stirling and Blackburn Botha bombers. *The Aeroplane*, January 17, 1941, page 63, 1 illus.

The 73rd Week of the War in the Air. The air warfare which will commence as soon as flying weather again becomes favorable will, according to this article, make last Summer and Autumn's air action look pale by comparison. Four types of airplanes have been held back by the German Luftwaffe, until sufficient numbers have been accumulated for the Spring offensive. These are the new Focke-Wulf Fw 187, a twin-engined fighter bomber, resembling the less successful Messerschmitt 110, the Fw 197, a single-engined fighter powered by an 18-cylinder two row radial, the Messerschmitt 115, a fast version of the 109, powered by a 24-cylinder X-type engine and a Heinkel He 177, a four-engined bomber. New versions of well-known airplanes will be the Dornier 217, a modified Do 215, and an improved Junkers Ju 88 dive-bomber. *The Aeroplane*, January 31, 1941, pages 133, 134, 1 illus.

Welding

The Spot Welding of Light Alloys. Gordon H. Field and H. Sutton. The record of a report made to the Research Council of the Institute of Welding on the spot welding of Duralumin, Alclad and Aluminum-Magnesium Alloy M. G. 7. Samples of the aircraft metals were sent to three different welding firms and their work was X-rayed and micro-examined. Then shear and fatigue tests were made of single spots before and after normal heat treatment on samples of similar and dissimilar thicknesses. The manner in which these tests were conducted and the results obtained are given and tabulated. *Aircraft Engineering*, January 1941, pages 17–26, 33 illus.

Air Navigator's Syllabus

Due to the fact that radio triangulating rather than the radio directional beam has been used extensively over the airways of the British Commonwealth air navigation aboard a British commerical transport airplane is a full-time job for a specialist. British air navigators are certified, much as are marine navigating officers. Air Ministry requirements for Second Class and First Class Aircraft Navigator's licenses, and the examinations leading to granting such certificates are extremely rigid and comprehensive. The lowest grade or Second Class certificate requires three hundred hours of experience in the air as pilot or navigator, while the air requirements for the First Class certificate include six hundred hours in the air, one hundred as navigator and fifteen hours of cross-country night flying using celestial navigation.

Substantial as they are, the air requirements are the simplest part of the examinations which take three and five days, respectively, and cover all forms of air navigation, as well as, meteorology, signalling and British Civil Air Regulations.

"The Complete Air Navigator" might be termed an encyclopaedic digest of the entire range of knowledge and information necessary to qualifying for a license. It is both a guide to a complete course of study and a condensed text which is ideal for final preparation and review prior to taking the examinations.

Chapter 1 summarizes some of the necessary mathematics, including plane and spherical trigonometry. Succesive chapters deal with map and chart projections, compasses and aircraft instruments, radio direction finding and signals, dead reckoning and pilotage, celestial navigation, tides and tidal data, meteorology and weather analysis. In the appendix is found data on international legislation, a bibliography, various tables, examination details and requirements for navigator certificates, and information as to where and when examinations are given.

The book is recommended to instructors and students of air navigation both as a guide to study and as a compact reference work.

The Complete Air Navigator, by D. C. T. Bennett; Pitman Publishing Corporation, New York, 1940; 370 pages, 159 illus. $5.00.

Books reviewed in this section may be purchased, or borrowed without charge, from The Paul Kollsman Library, Institute of the Aeronautical Sciences, 1505 RCA Building West, Rockefeller Center, New York, N. Y.

Weather Analysis

The application of the principles of physics and mathematics in the forecasting of weather has been a development of major interest in the science of meteorology during recent years. Results of researches have been presented in many papers, and the widespread increase in meteorological data gathered from all parts of the world has served to advance much of what has been theory, toward recognized principle. Due to the rapid development of the science and the number of papers which have been published in unrelated form, the need has long been apparent for a book to present in comprehensive form the principles and theories underlying the modern methods of weather analysis and forecasting in such a manner as to facilitate their application to actual forecasting. Such a book is "Weather Analysis and Forecasting," by Dr. Sverre Petterssen, of M.I.T.

The book makes no pretense of covering the entire field of meteorology, but deals with those aspects of the subject which experience has shown to be directly applicable to actual forecasting. For the average student it is a desirable extension in the scope of study found in general meteorological courses and texts. Dr. Petterssen covers much familiar ground but augments each point and subject with principles and equations pertaining to it, many of which are used in calculating problems of air mass analysis and weather forecasting. This adding of the tangible tools of a science to its more or less general aspects greatly enhances the interest of students engaged in its study.

The first chapter deals with air-mass characteristics. It is followed by chapters on stability and instability in relation to weather phenomena, production and transformation of air masses, kinematic analysis as regards wind and pressure and frontogenesis, frontal characteristics, waves and cyclones, an interesting chapter on isentropic analysis, forecasting of displacement of pressure systems, fronts and air masses, deepening and filling and the technique of analysis and forecasting. Each chapter is more or less independent of the other, with exception of the last three which are interdependent. The book is based upon a series of lectures on synoptic meteorology delivered by the author during the years 1935–1940 before the Weather Bureaus of Norway, Canada and the United States; the U.S. Navy Department, California Institute of Technology, Oslo University, and the Massachusetts Institute of Technology. While the author states that it has been written mainly for teaching purposes, the work is recommended for use by professional forecasters.

Weather Analysis and Forecasting, by Sverre Petterssen, Ph.D.; McGraw-Hill Book Company, Inc., New York, 1940; 505 pages, $5.00.

Airline Advertising

Making people air-travel conscious was the task confronting American Airlines, Inc., and P. P. Willis, who, for many years, helped direct their advertising efforts tells the story of how this was done.

A chapter on "Facing the Fear Facts" deals with the American Airlines' advertisement which ran early in 1937 titled "Why Dodge This Question: *Afraid to Fly?*" Another chapter on "Debunking the Winter Attitude" discusses the reasons why passengers who flew during the summer went back to ground travel in the winter. That this obstacle was overcome is evidenced by the fact that during the first ten months of 1940, more passengers were flown on American Airlines in October than during any other month.

These are only two of the problems discussed in this interesting story of the sales problems of a major air transport company and the solutions arrived at as a result of frank and open discussion among management, sales department and the advertising agent.

Your Future Is in The Air, by P. P. Willis; Prentice-Hall, Inc., New York, 1940; 171 pages, $2.00.

For Those Who Want Jobs in Aviation

There are thousands of men who are attracted to aviation but who do not know just how to make a start. There are scores of companies needing capable men in many types of aeronautical activities. These men and these companies should be assisted by "Careers in Aviation," which sketches the various kinds of jobs that exist, and how to prepare for them.

Ben B. Follett, the author, has been in aviation for over twenty years. In his book he has managed to present a genial, readable but factual summary of the knowledge and work required, not only of private and commercial pilots and mechanics, but of stewardesses, airport control operators, executives, engineers, and others.

Perhaps it is inevitable that much emphasis is laid upon pilots and their training. The comments on the various types of certificates and their value are excellent.

The first chapter tells the reader to choose a given line of endeavor and stick to it, rather than dash from one thing to another. This is good advice in any business, but especially so in aviation, in which there can be no substitute for specialized knowledge, experience, and work that is both hard and perfect. This is a book to recommend to anyone who wants to "get into aviation."

Careers in Aviation, by Ben B. Follett; Waverly House, Boston, 1940; 254 pages, $2.00.

Half a Century With a Camera

In this record of exciting experiences by the most famous American news photographers there is only one chapter devoted to aviation but that one so full of "firsts" that it is a part of aeronautical history.

Probably no correspondent, covering either news or photographic assignments, ever had as many thrilling experiences as this eighty-four-year-old photographer. As Richard Harding Davis said, "no war is official until Jimmy Hare is there to cover it; he made the Russo-Japanese battles famous."

In 1906 he chartered a balloon and took the first aerial photographs of New York from the air. To make the flight, he had to wait on Staten Island for many days until the winds were favorable. At the end of the trip he was dropped into Flushing Bay and rescued by a boat. The balloon was piloted by the veteran balloonist, A. Leo Stevens.

The greatest of his aeronautical photographs was of a flight by the Wrights at Kitty Hawk in 1908. This was undoubtedly the first news photograph of an airplane in flight. Many others had been taken of flights of the Wright Brothers but Jimmy Hare was the first to take one on an assignment from Colliers' magazine.

The author continues the legend that the Wright Brothers prevented newspaper men coming to see them fly. Several years earlier they had invited newspapers to send reporters to witness flights at their flying field near Dayton. Many came and newspaper clippings show that they did. The hardships of the correspondents and Jimmy, the photographer, in hiding behind bushes on the sand dunes near Kitty Hawk, after daily walks of eight miles, still make a good story of the determination of the group.

Orville Wright tells of how Arthur Ruhl, one of the party, was sent as an emissary to see how he would be received and of his being invited to stay to lunch. He had to decline as he feared the others would feel that he was getting a "scoop." The Wrights have always said that they knew the correspondents were hiding nearby, and in their usual unconcerned manner, went ahead with the tests of their improved airplane.

The account of the difficulty of the correspondents in sending the story over a single wire from Manteo, nearby, is told by different correspondents with slightly different versions, but it all makes a fascinating story.

The remainder of the book will be of great interest to all who take an interest in the outstanding historical events of the past forty years.

Jimmy Hare—News Photographer, by Cecil Carnes; The Macmillan Company, New York, 1940; 304 pages, $3.00.

Elementary Explanation of Weather

Meteorologists, whether they work at airfields or elsewhere, are asked not only what the weather is going to be tomorrow, but to explain what causes it. Instead of going into a long explanation of barometric pressure, storm centers, wind direction and similar matters, the weather man might well recommend that his questioners read "Rain or Shine." It contains very simple and easily understandable explanations of the causes of weather phenomena.

Equally elementary information is presented about climatic differences in various parts of the country, and between countries or sections of the globe that lie in the same latitudes. The seasons likewise are explained with a diagram showing the earth in different portions of its orbit around the sun.

Obviously, this book is not intended for the advanced meteorological student, but for the average man, woman and even child, to whom it brings a clear picture of the basic reasons for weather changes, weather predictions, climate, and the seasons.

Rain or Shine, by Marian E. Baer; Farrar & Rinehart, Inc., New York, 1940; 292 pages, $2.00.

Hitler Visits England

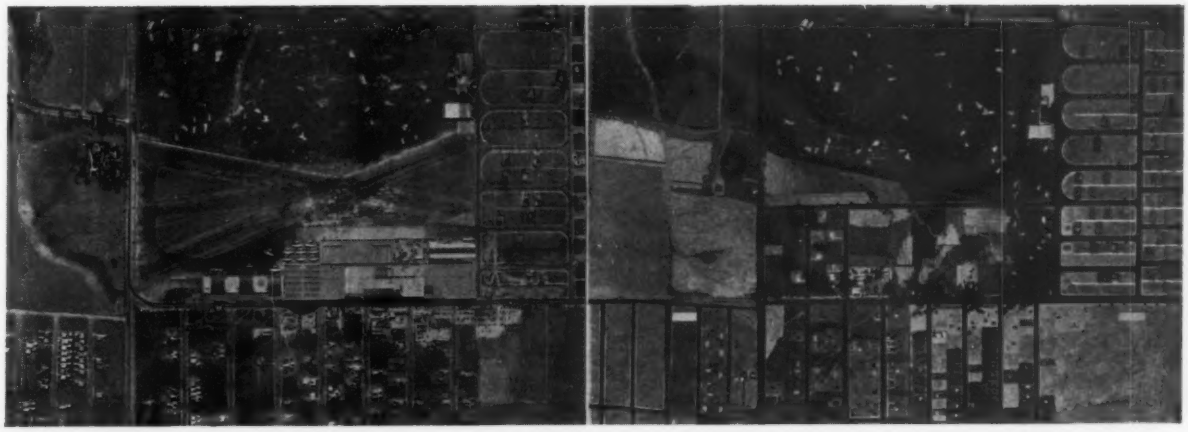
A nation is really defeated when it loses its ability to laugh. This book shows that England can, in its own insular way, still laugh at itself as well as at the enemy. This is a bit of winter evening's fun—an antidote for the constant flashes of disaster which mar the after-dinner radio programs. It begins with Adolf Hitler's decision to fly over England. While in flight, a bomb destroys the airplane, killing all its occupants with the exception of the Führer. He alone 'chutes to safety onto the English countryside. Clad in a Field Marshall's uniform, a bullet proof vest and heavy flying boots, without money or a knowledge of English, the leader of the third Reich's adventures are really sidesplitting. The illustrations by Low are, as usual, amusing.

The Flying Visit, by Peter Fleming; Charles Scribner's Sons, New York, 1940, 128 pages, $1.50.

Civil Air Regulations Digest

High on the list of required reading for pilots and students alike are the Civil Air Regulations, which form so important a part of all pilot and instructor's examinations. Questions such as: what is the minimum ceiling and visibility for acrobatic flight; the minimum altitude for instrument flight; the minimum ceiling for contact night flight; the zones of intersection in order of their priority—may all appear on an examination. It is therefore wise to have a copy of the Regulations handy in one's map case. A pocket-sized digest of Civil Air Regulations, simplified and indexed for ready reference has been compiled from the Civil Air Regulations for students, pilots and instructors. It covers every chapter of the Regulations in a simple, orderly manner.

Steele's Aid to Pilots, Fifth Revised Edition, edited by C. Earl Steele; published by the Author, Los Angeles; 116 pages, $1.00.



Here it is and there it isn't. The aerial photograph on the left clearly shows an aircraft plant and airport in the middle of the picture. On the right, the same site cleverly camouflaged makes it virtually unnoticeable from the air. These illustrations are from the book *Winged Warfare* by Major General H. H. Arnold and Colonel Ira Eaker.

Air Power and National Security

Even those who are closely associated with the Army Air Corps are bewildered by the changes that are made in the organization, operation and functions of air power as it is being developed in the United States. General Arnold and Colonel Eaker who have been intimately concerned with these changing conditions have written a book which is essential for any understanding of what is going on in the Army Air Corps expansion.

In addition to the primary purpose of the book they give glimpses of what has happened recently in other parts of the world to change the position of "winged warfare." Probably no one in the United States has had access to as many accurate reports from abroad or has talked with as many informed visitors as the Chief of the Air Corps. While the disclosures are restrained they are undoubtedly the most accurate obtainable.

The characteristics of military airplanes are described and their place in air tactics and strategy explained. The function and duties of each type of Air Corps officer and employee are clearly stated. The great expansion of military air bases and the urgent necessity for them are outlined.

With this as a background the reader is given the clearest and most detailed explanation of the recent changes in the organization, tactics, and strategy of the Army Air Corps. To this has been added chapters on air defense, aircraft production and aeronautical research.

For the old timer who wishes to be brought up to date, for the newcomer in aviation who wants to know what air power is all about and for the general public confused by so many divergent claims and opinions, "Winged Warfare" will give a comprehensive readable picture of what air forces may be expected to do in the future.

Winged Warfare, by Major General H. H. Arnold and Colonel Ira C. Eaker; Harpers and Brothers, Publishers, New York, 1941; 265 pages, $3.00.

Aviation Opportunities Explained to Boys

A great many boys hope to be pilots when they are old enough, or to play other parts in the swiftly growing aviation industry that they tend to romanticize. To guide their ambitions correctly Captain Burr Leyson gives advice based on his 21 years' experience in many phases of aviation. He explains very simply the duties and requirements of the various jobs, the amount and kind of training necessary, how to get it and what it will cost, average wages and salaries, and the prospects for advancement.

Captain Rickenbacker gives in Chapter Two, through an informal chat with the author, the background of the modern pilot, and explains how the war exerted an influence on modern aviation. He describes candidly what he considers the essentials of a modern pilot, and offers advice.

In the foreword C. R. Smith, President of American Airlines, compares the opportunities in aviation today with those found in the automobile industry in 1915.

The book can be recommended to any air-minded youngster. He will put it down with a better understanding of aviation's high standards, and perhaps with his own ambitions more carefully defined.

Aeronautical Occupations for Boys, by Captain Burr Leyson; E. P. Dutton & Co., Inc., New York City, 1940; 207 pages, $2.00.

Fifth Edition of Design Text

Differing from the first four editions only in printing and presentation, this encyclopedia on aircraft design continues to be a most helpful volume on how to go about designing an airplane. The book starts with an extensive list of term definitions and symbols used in airplane designing and construction. This is followed by a clever satire on how not to design an airplane entitled "Airplane Design Made Simple," by R. R. Osborn.

From here, the author begins with a survey on the general procedure in laying out the projected airplane, how the type, cost, weight, performance and other considerations influence design. Examples of both light aircraft, and large flying boats and landplanes are given.

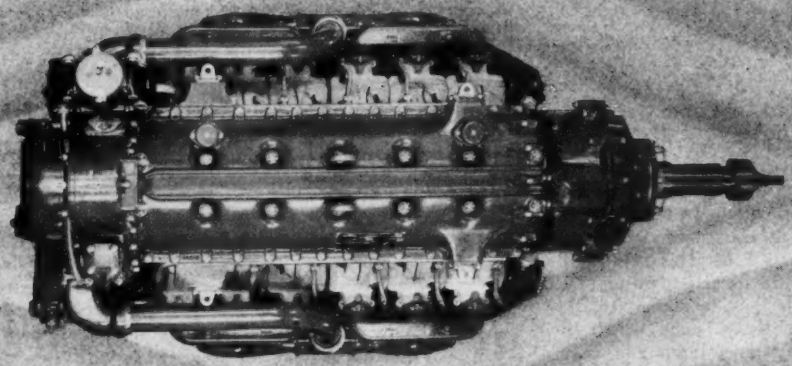
Aircraft materials from forests to spars, the mine to the sheet of alloy stock are discussed. Glues, rivets, welds are also scrutinized and compared. Differing from previous editions, some mention of plastic bonding agents is made. Building and operating costs, obsolescence and other of the financial considerations in airplane operation, which the designer must cope with, are analyzed.

The principles of stress analysis are outlined and applied to separate parts in different ways. The cost of making stress calculations is also considered.

The chapter on production is clear and informative. It outlines the latest production methods and encourages the designer to create aircraft which can be mass-produced in the modern plant.

The appendix of common aerodynamic data should come in handy for both engineers and students. The entire book, like its predecessors, is clearly written, and differs from them in contents only in modernization of material. The offset process used in the

STREAMLINED POWER



Now in the Navy—the "V" in-line, air-cooled, highly supercharged 12 cylinder Ranger engine. No other powerplant produces equivalent horsepower from such low weight and small frontal area. The Ranger engine offers both air-cooling and splendid opportunity for closely cowled streamlined design.

RANGER AIRCRAFT ENGINES

WITH RANGER THERE CAN BE NO COMPROMISE WITH QUALITY

Farmingdale, Long Island, New York · Division of Fairchild Engine & Airplane Corporation

fifth edition is a vast improvement over the mimeo used in the first four printings.

Airplane Design (Fifth Edition), by Karl D. Wood; published by the author, distributed by the Cornell Co-op Society, Ithaca, N. Y., 1941; 258 pages, $4.00.

A New Flight Manual

This text on the art of flying approaches the problem of flight training from the human rather than the technical side. While it follows the course of primary and advanced instruction, laid out by the C.A.A., faithfully, the author's insight and understanding of student problems adds immeasurably to the practical value of the book.

The author has declined to confuse his reader with a chapter on aerodynamics, *per se*, but states simply why the airplane flies, what the controls are and how they function. From here, the book proceeds to explain level flights, turns, stalls, take-offs, slips, skids, taxiing and landing. While the description of pre-solo instruction covers the customary material, it differs from the run-of-the-mill handling in generous use of common simple words—the straightforward, non-technical explanation of how and why.

By the time the reader gets past the solo stage, more technical language is introduced. Spot landings, spins and aerobatics, tight eights and forced landings prepare the student for cross-country flying. Probably because navigation and meteorology are in themselves, book-length subjects, only cursory examination is given of them. Practical information on what not to do while flying cross-country constitutes this chapter. The book concludes with an outline of information on engines, vocational opportunities, the Army and Navy Air Corps and the C.A.A. Civilian Pilot Training Program.

The author, for over 23 years a pilot and instructor, has drawn material more from personal contact with people than from other printed matter. As a result the book reflects a deep understanding of the human as well as the mechanical problems of flight. The illustrations by Clayton Knight are clear, accurate and decorative.

Modern Flight, by Cloyd P. Clevenger; Noble and Noble, New York, 1941; 290 pages, $2.95.

A First-Hand Story of the R.A.F.

A war correspondent relates the story of fighter squadrons No. 1 and 73 of the Royal Air Force. There's nothing routine about the book. It names names. It is the story of some of the first British air aces of the present war. Its chief characters are "Cobber" Kain, "Red Knox," "Leo the Lion" Clisby, "Bull" Halahan and some of the others who flew the Hawker Hurricanes in France in the days before Dunkuerque.

Who were these men? They were Irishmen, Australians, New Zealanders, typical examples of the "few to whom we owe so much" as Winston Churchill described the British airmen. The book gives an inside view of what actually happened in France, how these pilots, always outnumbered but never outfought, conducted themselves on the ground and in the air. Certain intimate stories, the kind that usually have to wait until a conflict is over, are revealed. They include "Cobbler" Kain's own account of how he landed a bullet-riddled, burning airplane because he forgot to hook his parachute harness, the incident of a French tavern keeper who offered to lock a fighter squadron into a champagne cellar; tales of spies and friends, heroes and cowards, endless tension, work, and sudden death.

The book is dramatic and well written. It tells the story of young men who have taken on a huge job and are doing it well. Best of all, the author has taken time out to humanize these heroes, showing that there are times in a soldier's life when a bath is more to be treasured than a decoration.

Squadrons Up! by Noel Monks; Whittlesey House, McGraw-Hill Book Co., New York, 1941; 20 pages, $2.50.

Dead Reckoning Simplified

The need for a book covering the different problems in the field of navigation by dead reckoning, or finding one's way in the air by accurate measure and computation of speed, time, distance and direction, has long been evident. Cross-country flying by visual reference is simple enough when visibility is good, landmarks and airports are not too far apart, and the supply of gasoline and time is ample. But there is added safety, satisfaction and pleasure in being able to rely on one's air speed indicator, compass, watch, chart and computer to make good the desired course and track.

"Radius of Action of Aircraft" may sound a bit out of depth for the average sportsman pilot as a simplified study in dead reckoning, but that is exactly what it is. When the C.A.A. began work on simplified texts for the Civilian Pilot Training Program, they sent two problems in figuring radius of action (when to turn back, given the fuel consumption and speed of the airplane) to several experts. Mary Tornich's solution was chosen for a simplicity and clarity which marks her development of the various problems in this volume.

Opening chapters introduce the need for being able to determine the radius of action especially when filing a flight plan. Subsequent chapters demonstrate the solving of simple course and drift triangles or the triangle of velocities, explain the effect of wind direction on heading and track, and discuss the problem of flying time and safety margin of fuel. Chapters 11 to 15 take up simple radius of action problems and progress to the problem of returning to an alternate base and finally to a moving base. The latter type of problem of course would apply only to naval aircraft returning to a carrier. The last third of the book deals with rules for piloting from the Civil Air Regulations, maps and charts, the compass, and an interesting but all too brief chapter on dead reckoning computers. The final chapter consists of a series of practical problems. The book is recommended reading for all interested in cross-country flying.

Radius of Action of Aircraft, by Mary Tornich; Weems System of Navigation, Annapolis, Md., 1940; 168 pages, 90 illus., $3.00.

IMPORTANT ITEMS

for Aviators!

New Books:

Simplified Celestial Navigation, Weems & Link $3.00

Radius of Action of Aircraft, Tornich $3.00

Instrument Flying, Weems & Zweng $4.00

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Mark II Aircraft Plotter $2.00

Dalton Mark VII Aircraft Computer $7.50

Brownell-Weems Star Finder $5.00

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Sea and Air Navigation

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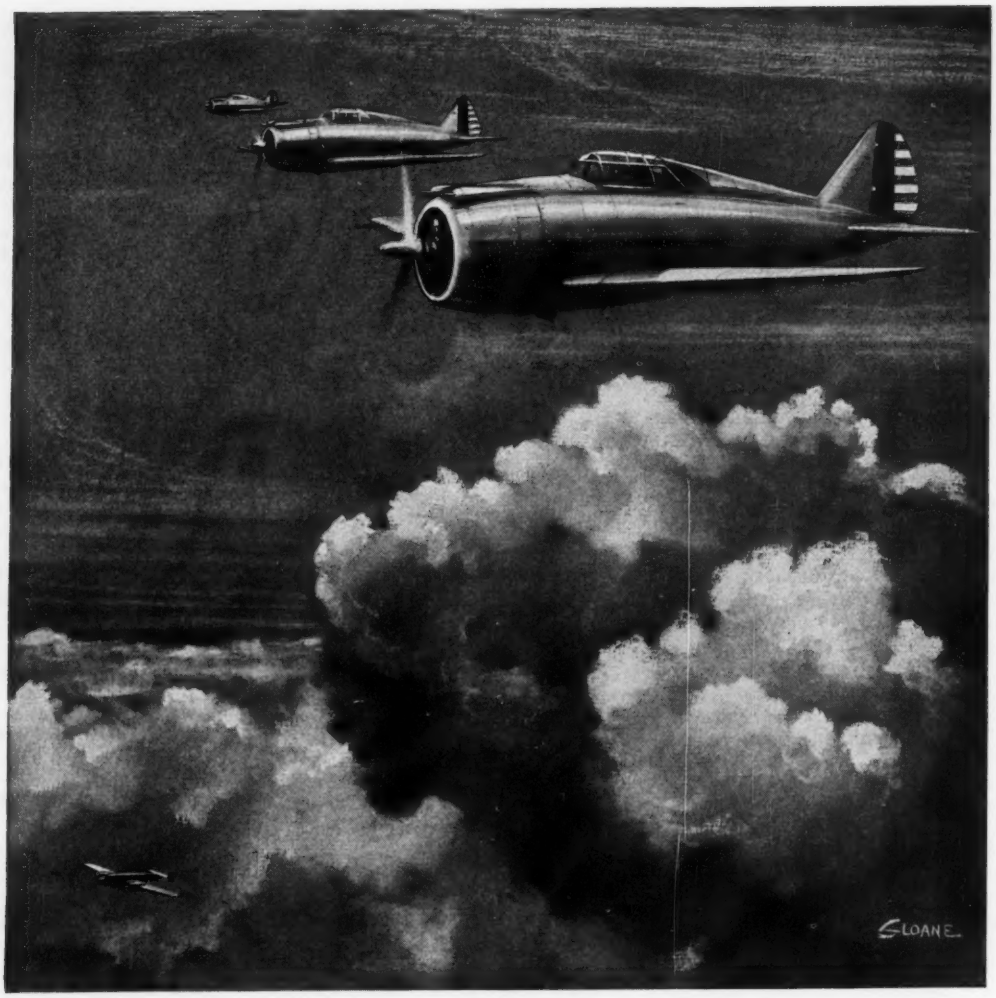
Annapolis, Maryland



REPUBLIC AVIATION

IN COMMAND "UP THERE". . . In the thin, cold air at 30,000 feet and over, Republic Aviation interceptors meet every challenge. Designed, built and supercharged for maximum military utility to counter high-altitude bombardment, these Republic Aviation pursuit planes will equip many squadrons in the powerful and rapidly expanding fighting forces of the United States Army Air Corps.

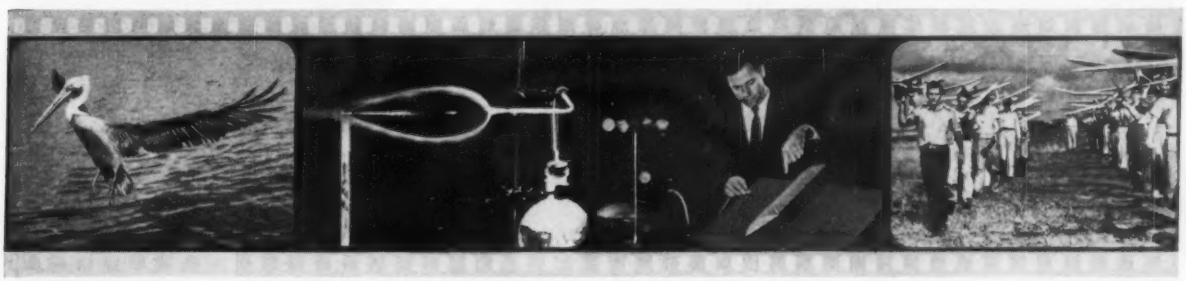
REPUBLIC AVIATION

REPUBLIC AVIATION CORPORATION
FARMINGDALE, LONG ISLAND, NEW YORK, U.S.A.

Dramatized Aerodynamics

A distinguished contribution to primary aeronautical education is offered the American public in the instructive motion picture short, "Youth Takes to Wings." The fifty-minute production by Bray Pictures Corporation, cooperating with Air Youth of America, is a movie version of the Traveling Air Show of The Franklin Institute.

Using a demonstration technique as fascinating as a magician's, Ralph McClarren, aviation expert of the Franklin Institute, illustrates the laws of aerodynamics by such startling feats as a perverse ping-pong ball which refuses to fall out of a funnel in an air jet and lifting a piece of paper from a flat desk by blowing air down on it.



Typical scenes from the motion picture, *Youth Takes to Wings.*

The demonstration, logically enough, starts explaining how man first tried to learn about flight by observing the birds, only to discover that he was not strong enough to fly on the crude, flapping wings which he was able to fashion. The use of a high-speed camera, studying the movement of the pelican, and other birds, shows that they gain propulsion and control by articulating their feathers on the trailing edge of their wings.

Following the bird sequences, the method by which flight and control are achieved, is demonstrated by model aircraft flown out over the audience. The principle of the rotating wing is shown by the spinning maple seed and Australian hunter's boomerang. These principles are then applied to the Autogiro and the helicopter.

The primary physics of flying are presented in a startling and simple manner. Bernouli's principle is indicated by a curved surface hinged to a board so that no air can flow underneath. When the demonstrator blows a stream of air over the top, the surface rises.

In a miniature wind tunnel, using the vapor of dry ice, the movement of air around objects, flat surfaces, airfoils, spheres and streamlined objects is charted, demonstrating lift, stalling, the advantages of streamlining and the reason for slots and similar auxiliary airfoils in present use. Finally, all of this information is collated and directly connected to model building and actual aviation of the present and of the future.

The motion picture was produced under the authorization of Air Youth of America.

Youth Takes to Wings, produced by Bray Pictures Corporation, New York, N. Y.; script by J. C. Bray and Ralph McClarren.

British Air Effort

A story of the R.A.F. which according to the preface has been "written, set up, bound, published and sold on the battlefield." The author goes in to tell us that pages 28, 29 and 30 in manuscript form were torn by shrapnel at the entrance to an Anderson shelter; that his secretary did much of her work during air raids as did those who assisted him with the research; that finally the book was printed and bound when enemy aircraft overhead were practically a daily occurrence.

Written by an author-soldier, it describes the work of the R.A.F. from the start of the war to the present. It paints a graphic picture of Britain's air war on all points—in France, Germany and Norway, in Italy, Africa, and the home front, of the Channel, the North Atlantic, North Sea and England.

The remarkable "Airman's Letter to His Mother" is reproduced in the book. Also included is a chapter written by Charles Gardner, British Broadcasting Company observer, on "The A.A.S.F. in France." This is followed by his famous broadcast of July 14, 1940, when he described a convoy battle which he viewed from the cliffs near Dover. A Postcript by J. B. Priestly lends still another viewpoint on accomplishments of the R.A.F. in the face of great odds.

Wings of Victory, by Ivor Halstead; E. P. Dutton & Co., Inc., New York, 1941; 221 pages, $2.50.

The History of British Flying

This brief summary of the history of British aviation follows all the phases of its development from the close of the first World War. In many ways, postwar flying in England faced problems similar to those which confronted airmen in the United States during the early twenties. Rail service in England was highly efficient, airports were few and far from cities and the equipment available consisted chiefly of war-surplus aircraft which were not profitable to operate.

Early air lines, operating to continental points received just enough subsidy to keep them flying and postwar aviation eked out a bare existence. In other parts of the British Empire where transportation was less plentiful, in Australia and other places, early air lines were more useful because they linked far flung parts of the Empire to the contact points of transportation and civilization. The origin and development of British Overseas Airway and Imperial Airways is outlined.

The study of the organization and background of the R.A.F. should be enlightening to those less familiar with the inner workings of this organization. Knowing that the history of the R.A.F. has already been well publicized, this section dwells more on the structure and function of the Air Arm. One of the useful tables provided indicates the relative rank of officers in the R.A.F., the Royal Navy and the Army. This table reveals that a Group Captain in the R.A.F. holds rank equivalent to a Navy Captain and an Army Colonel, and that a Flight Lieutenant is the equal of an Army Captain.

Finally, the work of the R.A.F. in the present war, what their function is now and will be in the future and the method by which men from the entire Empire are trained for air service is outlined.

British Aviation, by Major F. A. de V. Robertson; Longmans Green & Co., New York, 1940; 47 pages, $0.36.

THE DEFENSE IS ALERT

IN anti-aircraft defense, threatening airplanes must be located with utmost speed. To solve this problem Sperry has developed the Sound Locator or "mechanical ear" by which the defense can determine the location of on-coming airplanes and their direction of flight.

Once located, they are soon illuminated by the piercing shaft of the 800 million beam candlepower searchlight, which was developed by Sperry to meet anti-aircraft defense requirements in the last World War and has been continually improved and produced by Sperry ever since.

Still another Sperry device, the Universal Director, working many times faster than the human mind, automatically calculates the firing data and electrically transmits it to the waiting anti-aircraft guns.

Truly, American defense is on the alert.

SPERRY GYROSCOPE
COMPANY INCORPORATED
SPERRY
BROOKLYN, NEW YORK

Other Sperry products include the Gyro-Horizon, Directional Gyro, Gyropilot, and Automatic Radio Direction Finder

The front wing-spar of the Boeing Clipper. Both the upper and lower spar chords are made of squared steel tubes. This illustration is from *Aircraft Tubing Data* by Summerill.

Data on Aircraft Tubing

A second edition of a technical data handbook on design, manufacture, application, welding, inspection, bending and protection of seamless steel tubing. Chapters on the various phases of tube manufacture and use, written by leading experts in their particular field, comprise most of the text. A. J. Williamson, chief metallurgist of the Summerill Company, describes the manufacture of seamless aircraft tubing. The Mannesmann process, used to shape and pierce the ingot into tubing, the Diescher process for elongating the rough tube and the cold drawing which finally finishes the tube are outlined. Tables for the chemical composition and physical properties of various types of tubing are provided. Specifications of various shapes of tubing as well as a detailed study of aircraft size tolerances are also given.

L. E. Reisner, President of the Tennessee Aircraft Institute, offers a practical study of the application of tapered tubes in aircraft production. How inside and outside tapered tubes are applied to fuselage, wing and empennage, engine mounts, compression members, control columns and tubes and many other tasks, is explained in this chapter.

An entire section is devoted to the various ways of welding steel tubing. H. R. Morrison, of the Linde Air Products Company, in his chapter on oxy-acetylene welding of chromium-molybdenum steel tubing, explains the technique of various welds and makes recommendations for correct designs allowing easier and stronger execution of the unions. The effects of welds on the metal itself, welding materials and technique procedure control, qualifications of welders and jig and fixture design are closely studied.

Frank B. Bolte of Boeing gives an outline of the special adaptation in design that must be made for work which is to be arc-welded. Besides the usual studies of material, equipment and technique, this chapter indicates how new types of machinery have been used to prepare steel tubing for arc-welds.

The next chapter, written by H. P. Reiber of Lycoming, details equipment, procedure and use of atomic-hydrogen welding. Magnaflux inspection and its application to welded portions of steel tubing is discussed in the chapter on non-destructive inspection by H. J. Huester of the Navy Bureau of Aeronautics.

An important subject on which little has been written thus far, the bending of aircraft tubing is handled in a chapter by H. M. Williams and C. G. A. Swanson of Williams, White and Co. The use of revolving dies, floating wiping dies and various applications of presses in order to form the tubes without risking inside collapse are explained. The reason for and prevention of corrosion in aircraft tubing is covered in a chapter on corrosion protection by Charles W. Woodrow, chemical engineer for the Naval Aircraft factory.

The final section of the text contains a wealth of reference material, which alone, justifies possession of the book. Standard aircraft symbols, tables of properties of aircraft tubing, design data and commonly used formulas, and other commonly used mathematical data are included.

Despite the fact that this book was written by leading technicians and edited by a college professor, it has religiously kept away from the slide-rule point of view.

Aircraft Tubing Data, John E. Younger, Consulting Editor; Summerill Tubing Company, Bridgeport, Pa., 1941; 140 pages, $2.00 with ring binder and leatherette cover, $1.50 with wire binder and fibre cover.

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ALCOA

1

WE INTERRUPT our regular messages to report what's what with aluminum.

AT THE MOMENT delivery for civilian use must make way for defense. Everybody knows the reason. Defense requires and is using more aluminum per month than peacetime America ever consumed.

NEVERTHELESS, we intend that no one shall have to forego the things aluminum can do best one minute longer than we can help.

THERE IS NO SHORTAGE of bauxite, nor of anything else, except time. And Father Time is being given the race of his life.

WE ARE MOVING, for example, 35,000 yards of earth a day at Alcoa, Tenn., to get 50 acres under a single roof by September. It will require 193 carloads of roofing felt. Some of the operations in that plant will start even before the walls are up. That's an annual rolling capacity for 120 million pounds of high strength alloy sheet coming along fast.

LAST MARCH WE STUCK the first shovel in a cow pasture near Vancouver, Wash. In September a 30 million pound plant was delivering metal. It has been doubled, already. A third 30 million pound unit starts delivering in April; a fourth in May; a fifth in June. From cow pasture to 150 million pounds annual capacity in 15 months.

A SIDELIGHT: To make that 150 million pounds of aluminum, we first have to build factories to make 120 million pounds of carbon electrodes. We have to obtain the equipment (transformers, rectifiers, and the like) to feed 162,500 kw. of electricity into the reduction furnaces. This is a generating capacity equal to that of the state of Delaware plus twice that of Mississippi.

WHAT OF TOTAL PRODUCTION? In addition to Vancouver, further installations are being made at other of our plants, so that in less than a year their total capacity will be more than double that of 1939, when 327 million pounds were produced.

IN THE VERY MIDST of this demand we have lowered the price of aluminum ingot 15%. We state, without reservation, our hope that the price can be still further reduced.

DEFENSE PRIORITIES on aluminum simply say that there are some fundamental things that aluminum does supremely well. It will do them still better as important lessons in production, fabrication, and application are learned from every additional pound being produced and used.

ALUMINUM COMPANY OF AMERICA

House Organs and Catalogues

Protecting Employees' Inventions

Although established legal practice gives the company possession of any invention or improvement created by an employee working on the company's time, Bell Aircraft Corporation has devised a method of encouraging, protecting and compensating employees who discover methods of improving their work and saving time and material. The employee who has an idea is encouraged to crystallize it into a standardized form. From here it goes to a patent board, who examine the idea. If the development is found to be useful to the company, assignment is accepted and the inventor receives a just compensation. If it is not applicable to the Bell production scheme but still has commercial value, the inventor receives a release, and is given the advice of the company's Patent Counsel on how to protect and exploit his idea. *The Bellringer*, March.

Oxygen Breathing Equipment

An illustrated catalogue folder of oxygen breathing equipment manufactured by the Puritan Compressed Gas Corporation. Equipment complies with the Civil Air Regulations which will require oxygen breathing apparatus to be carried aboard all air transports carrying passengers above 10,000 feet for periods of over 30 minutes effective May 1st. Flow gages, masks, regulators, stems, tanks and other important accessories are shown.

Test Pilot Tells

"I've Test Flown the XSB2C-1." H. Lloyd Child. The Chief Test Pilot of the Curtiss Buffalo plant tells a few significant facts about the new dive bomber. According to this article, the XSB2C-1 can carry twice the load, go 100 m.p.h. faster and has twice the range and fire power of any similar type ever developed in the U.S. Although official censorship probably kept exact figures out of print, Child's comments indicate that, despite the excellent top speed performance of the new bomber, its take-off and landing characteristics for carrier operation have remained extremely favorable. *Curtiss Fly Leaf*, January-February.

Fast Aerial Photography

Aerial Photographic Quick-Work at Wright Field. . . H. F. Stiffler. For many years, the U.S. Army Air Corps felt that there was a need for a rapid process for developing and printing of aerial pictures in the airplane for delivery within a short time of exposure. Because of the corrosive action of photographic developers on metal parts of the airplane, no real progress was made in this direction until 1939, when the first spill-proof quick-work unit, made for use in the observation airplane, was built at Wright Field and used during the Third Army maneuvers in May 1940. This unit used a reflex attachment on the camera and positype paper. Due to the slowness of this material, it was found to be unsatisfactory. The system was redesigned to use regular negatives, processing them in an 80° developer. The method which permits the delivery of finished prints, dropped from the airplane within eight minutes of the time the picture is taken, is described. *Air Corps News Letter*, February 1, 1941.

Hunting Trouble

The Inspection Department. Keith Hight. An explanation of the various methods used in inspecting materials, castings and fabricated parts which go into Bell airplanes. X-Ray, Magnaflux and visual inspection are among the methods used for detecting flaws and sub-standard materials or parts. *The Bellringer*, March.

Town Identification from the Air

No improvement project is closer to the hearts of cross-country flyers than the simple and inexpensive community undertaking of adequately and legibly marking the name of the town, city or community so that it can be recognized from the air. Strange as it may seem, even airfields and airports are often lacking in any identification, other than that obtained by their location on the chart and radio or light beacons if they are so equipped.

Finding one's way across country in a light airplane without a radio is simple enough when visibility is ten miles or better, for then most of the feature shown on aeronautical charts—towns, cities, bodies of water, roads, railroads, and various topographic features—can be identified by relative position. But when visibility closes down so that only a comparatively small area is seen, identification becomes a difficult and serious problem.

The Aviation Defense Association, Inc., in order to encourage voluntary air marking, has issued a comprehensive brochure on how it is done. Standard letter patterns are shown in diagram and a method described for enlarging them to any desired size. Procedure for laying out a sign on a large roof-top or other flat area is given together with suggestions for painting. The Airplane Owners and Pilots Association is also distributing a considerable number of these broadsides. Aviation Defense Association, Inc., *Directions for Erecting Air Markers.*

Motors for Wind Tunnel Models

General information of the high-frequency polyphase electric motors used as model power plants in testing "Power On" wind tunnel models. Because each model made seems to require power plants of a different size and performance, a wide variety of type applications and power output has been provided. This booklet describes these electric model motors, and outlines their application to powered wind tunnel research. *Sawyer Electrical Mfg. Co.*

Building Gas Powered Models

An introduction to problems involved in building larger and heavier gas model airplanes. Design, tools, materials, construction and points in class instruction are discussed, together with necessary precautions in handling fuel and testing engines. *Air Youth Horizons*, March.

Self-Sealing Aircraft Fuel Tanks

Description of many different tests made on self-sealing fuel tanks at Wright Field. Some of these include vibration tests, sloshing tests, gum extraction tests, frigid temperature tests, as well as different types of gunfire tests. *Air Corps News Letter*, February 15.

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America's Youth and Aviation

Digest of a speech delivered by Paul McNutt at the Second Annual Air Youth Dinner. The speaker discussed the transition from boyhood interest in airplanes and the building and flying of models to careers in aviation. It is said that the two chief reasons boy apprentices drop out of their chosen field are (a) they find that the job involves a lot of additional subjects or work they are not interested in, and (b) lack of ability and training in getting along with people. The Air Youth Scholarships to the Boeing School of Aeronautics, the Casey Jones School and the Spartan School of Aeronautics are mentioned, as well as the accomplishments of the Civilian Pilot Training Program during 1940. *Air Youth Horizons*, February.

Tool Design

Consolidated's chief tool designer, Ralph E. Oversmith, outlines some of the tool design problems and procedure at Consolidated. Some of these include deciding on necessary equipment, design of special equipment, insuring the proper sequence of production and delivery of machine tools and fitting them into the production layout. Different types of tools are described together with some of the paper work of the department. *Consolidator*, March.

Aeronca Super Chief and Trainer

Features and specifications of the 1941 model Aeroncas. The Super Chief powered by a Lycoming or Continental 65, cruises at 100 m.p.h. and has a landing speed of 38 m.p.h. while the 50 and 65-hp. Trainers cruise at 82 and 90 m.p.h., respectively. Performance data on all models are shown. *The Aeronautical Corporation of America.*

Wind Tunnel's Use Explained

Guinea Pig. . . "Fritz" Townsend. Not long ago, this article states, the only accurate way to determine the flying characteristics of a particular design was to build a prototype and find out. Since that time, the technique of studying the behavior of scale models of a particular design in the wind tunnel has been developed, which effects great economies in time, money and frequently life. The chief of Bell Aircraft's Aerodynamics Department explains the application of this technique as applied to the latest types of fighting airplanes, how the small model is used first to determine general characteristics and larger models are used later. Finally, the prototype itself is put into the full scale wind tunnel, where it acts as its own "guinea pig." *The Bellringer*, March.

Auxiliary Power Plant Development

Brief analysis of some of the auxiliary power plant development problems being studied at Wright Field. These include the question of the use of small engines, storage batteries, or more efficient generators driven by the main power plant. The effect of high altitude operation is discussed together with considerations of power output and weight. *Air Corps News Letter*, February 15.

Hagner Planetarium and Sun Dial

The Position Finder Corporation makers of the Hagner Position Finder computer, announce a planetarium and sun dial, which for purposes of instruction can duplicate many of the functions of the more expensive, precision-made computer. Altitude, latitude, time, declination, meridians, poles and horizon can be marked or indicated by sliding indexes on several circular scales. An azimuth disc, terrestrial, or celestial globe can be mounted within the ring scales for study. A list of functions with illustrative examples is also given. *Position Finder Corporation.*

Data on A.O.P.A.

Brochure outlining the services and aims of the Aircraft Owners and Pilots Association, an aviation counterpart of the American Automobile Association. It is a non-profit organization of aircraft owners and pilots formed to better the conditions and services for private flying in the United States. Membership is limited to active non-air line pilots or owners. Individuals who have soloed aircraft are considered pilots. Membership fee is five dollars a year. *Aircraft Owners and Pilots Association.*

Taylorcraft 1941 Models

Catalogue folder announcing the Taylorcraft Deluxe and the Tandem Trainer. Details and specifications of both airplanes are included together with an air view of the newly completed Taylorcraft plant at Alliance, Ohio. *The Taylorcraft Line*, New York and Chicago Sportsman Show number.

History of Turbo Superchargers

The turbo supercharger first attracted wide attention eighteen years ago when Major R. W. "Shorty" Schroeder established a world's altitude record in a LePere biplane equipped with a turbo supercharged power plant. This article contains a layman's explanation of this system which resembles a gas turbine coupled to a centrifugal air blower, indicating the advantages and drawbacks of this type of installation. *Consolidator*, February.

Aircraft Roller Bearings

A new addition to the looseleaf catalogue of the Shafer Bearing Corporation contains an explanation of the concave roller design which combines all the essential features of anti-friction bearings. Sectional drawings of two types of self-aligning double row shielded roller bearings, giving their size, weight and maximum static load. Similar information is provided for turnbuckle eye and rod end bearings. Individual specification sheets for each item are also provided.

Handbook for Federal Employees

Handbook on Government Air Travel Regulations. A booklet has been prepared by Transcontinental and Western Air to clarify the established practices and procedures incident to the use of the commercial air lines by employees of the United States Government when traveling on official business. Justification, discounts, itineraries and costs for civil and military employees are discussed. *Transcontinental and Western Air, Inc.*

From Kites to 'Cobras

An outline of the aviation career of Max Stupar, coordinator of manufacturing at the Bell Aircraft Corporation plant. At the age of ten, he began seriously studying how much weight a particular kite would lift. From these he progressed to gliders and airplanes. This article relates the growth of his career as an airplane designer, builder and production expert. *The Bellringer*, March.

Automatic Stabilizer Experiments

"Busdriver's Holiday." Joseph and Leo Eckstein. An account of experimental work with model airplanes on an automatic stabilizer. The device is a vertical fin set slightly forward of the aileron and streamlined into the airflow. Any deviation in airflow such as caused by a slip moves the fin which in turn causes the aileron to compensate and right the aircraft. The action is entirely automatic and instantaneous, requiring no conscious attention or physical effort on the part of the pilot. In a demonstration before the Army Air Corps a fast low-wing model airplane with no dihedral was flown through a whirlwind with a diameter of twice the wing span without any wing dip or deviation from stable level flight. The only noticeable change was a distinct revving up of the engine as it passed through the low-pressure center of the whirlwind. Other experiments of these two Lockheed employees are described. *Lockheed Aircraftsman*, February.

(*Continued on page 43*)

Rough 'em Up!

All aerial warfare is a war of nerves. That's why fighting men who fly are the pick of the lot.

And that's why Kollsman Precision Aircraft Instruments fly with you.

For these instruments which give to you your sixth sense . . . that of Flight . . . are themselves made with metals sensitive as nerves, with almost microscopic gears—mechanical minds for men who fly.

Yet they withstand the punishment of dive-bombing, the shattering recoil of a dozen guns, the sudden lift of a released bomb-load, the lightning dives and climbs of combat . . . always reliable, always "there", always precise.

Rough 'em up! You can rely on Kollsman for precision.

From the Industry

(*Continued from page 8*)

continuously by celestial observations. This method of navigation from a steady platform giving unrestricted opportunity for taking sights, can be extremely accurate. The complete absence of turbulence and relative freedom from attack will also permit making a long and accurate bombing approach.

"Bombs dropped from these levels reach terminal velocity very quickly due to the low density of the atmosphere. Although accuracy will be affected at times because of high winds, this will be offset by the greater velocity reached by the bomb in the upper levels.

"Before this war is over, I predict we will see a great deal of pressurized cabin bombers operating over long distances at altitudes of 40,000 feet or even higher. This military development of stratosphere operation will pave the way for peacetime utilization of such flying to link all nations, all peoples, closely together. The time now required for transoceanic flight should be cut in half and at the same time the factors of safety and comfort of air travel will be increased proportionately to the increase in speed."

Republic Aviation Corporation

Extensive sub-contracting arrangements, to expedite production on Republic Aviation Corporation's contract to build $62,000,000 worth of high altitude pursuit airplanes for the U.S. Army Air Corps, have been completed with more than 48 large and small business organizations throughout the country, it was announced by J. L. McClane, Vice-President and General Manager.

The total sub-contracted orders amount to more than $2,831,000, a figure which does not include engines or propellers, he said. Work is being done in 22 states from California to New England. Among the items to be produced outside the Republic plant and delivered there for final assembly in Republic's fast interceptors, are a variety of materials and parts including gears, fire walls, shock struts, control surfaces, machine parts, upholstery, plastics, exhaust manifolds, armor plate and engine mounts.

It was stated that with the recent formation of a Materiel Department by the Company, the number of sub-contractors will be greatly increased. Through this new department, a much larger portion of the Company's business will be given to outside producers, in order that all available facilities will be utilized to accelerate manufacturing operations.

Surveys have been made of the motor companies of the Detroit area, and the Company feels certain that a substantial amount of the work can be done by the motor industry. Educational orders with the Hudson Motor Car Company may develop into an extensive sub-contracting program to be assigned to the automobile plants.

Republic Aviation Corporation has made substantial use of several sub-contracting facilities for several years and throughout the Company's recent production programs much work has been given out. Therefore, Company officials view the problem of expanding this program as one of tapping new sources and increasing the amount of outside production rather than embarking on an entirely new program.

United Air Lines

After four months of the most extensive flight tests ever made in studying aircraft fuel and engine operation, United Air Lines engineers are compiling results which, it is said, will prove of vital importance to both commercial and military flying.

Details of the tests, made in a standard United Air Lines Mainliner assigned to the project as a "flying laboratory," have been disclosed publicly for the first time by Ray D. Kelly, superintendent of engineering research for United. The official said that the so-called "detonation" studies involved a half dozen leading brands of aircraft fuel, ranging from 73 to 100 octane rating. He added that, for the first time, engineers were enabled by delicate instruments to "look inside an aircraft engine in flight and see what was happening."

The tests were conducted by engineers of United Air Lines and the Standard Oil Company of California. Approximately $25,000, including 174 hours of flying time, was spent on the project. Flights were made from Oakland, Burbank and Palm Springs.

Instruments installed in the cabin of United's Mainliner made it possible to take motion pictures of instrument indications of the output of engines, fuel-air ratios, temperatures of fuel mixtures, fuel consumption, manifold pressure, engine speed, cylinder head temperatures and other pertinent facts regarding the performance of various fuels. A torque meter developed by the Pratt & Whitney Aircraft Company enabled engineers to obtain extremely accurate readings regarding the output of the Mainliner's engines by measuring the torque or twist actually imparted to the plane's propellers.

One of the most important lessons learned, Mr. Kelly said, was that there is no advantage in using high-grade fuels if spark plugs are not in perfect condition. Another finding was that present laboratory tests do not definitely establish the relative qualities of fuels as they are found in actual flight. All fuels tested, he reported, were of high grade but they were not entirely comparable even though they had been shown to be so in laboratories. Some proved more efficient for take-off, some were better for cruising, and some produced lower cylinder head temperatures.

The tests definitely showed that we have not exhausted the possibilities of increased economy, efficiency and horsepower with our present air-cooled gasoline engines and with our present carburetion methods.

House Organs and Catalogues

(*Continued from page 41*)

The Wilder Micro Projector

A catalogue folder giving details and a description of a projector which throws a magnified image of a part or irregular shaped piece upon a screen for contour inspection and comparison of its shape to specification. It is said to be ideal for rapid inspection of gears, screw threads, punchings and other irregular shaped parts such as used in aircraft engines, instruments, watches, and other machines. *R. S. Wilder, Inc.*

Description of Curtiss Types

The expanded manufacturing facilities of the Airplane Division of the Curtiss-Wright Corporation has made the production of eight varied types of military aircraft possible. Photographs and descriptions of the P40, 81-A (British Tomahawk) and 75-A pursuits, the SB2C-1 Dive Bomber, SO3C-1 Scout Observation, CW-20 Transport, CW21 Interceptor Fighter and CW22 Trainer are given. *Curtiss Fly Leaf*, January-February.

The Automotive Industry in Defense

No. 1 Job. A report on the automobile industry's assignment in the task of building machinery for National Defense. Among the important items of military equipment which are being produced are airplane sub-assemblies, engines and armament. *Automobile Manufacturers Association.*

"Beaverbrook Showed Me a Cryptic Cable

MR. MARTIN DOING VERY NICELY HERE....DID SOME BOXING YESTERDAY AND WON BY A K.O. ...

Official British Press Service Photograph of Destruction at Taranto

***"The Glenn Martin Bomber . . . has won its wings with distinction . . . Beaverbrook showed me a cryptic cable he had received from a squadron-leader friend of his. The cable merely read, 'Mr. Martin doing very nicely here. Did some boxing yesterday and won by a K. O.'"*—QUENTIN REYNOLDS, in Collier's for January 25, 1941.**

Cablegrams are expensive; adjectives are luxuries. But in unadorned dispatches from the Mediterranean the Martin 167-B4, which the R. A. F. has dubbed the "Maryland," earns simple tribute from Britain's fighting men.

We read that the "Maryland" is "well suited to desert warfare." And Britain's enemies fall back in confusion from bomb-shattered strongholds in Northern Africa.

"A Glenn Martin bomber is credited with taking the Taranto pictures." And a round-up broadcaster from Cairo tells of an airplane which rode over the angry, awakened Italian naval base in the wake of British bombers and roared away with pictures of the ruin below, while pursuit craft and anti-aircraft snapped at its tail.

That cablegram above—it is an example of terse reporting; a thumbnail story of a bomber that can turn and fight like a pursuit ship.

And of vital importance is the fact that several hundred of these bombers have been sent into the war zones. To produce them Martin broke a world record of construction, built a 440,000-square-foot plant addition in 77 days, flew the first ship in six months and turned out the first order of more than a hundred in ten months. "Mr. Martin" is indeed "doing very nicely."

THE GLENN L. MARTIN COMPANY, BALTIMORE, MD., U. S. A.

Martin
AIRCRAFT

Builders of Dependable Aircraft Since 1909

TRADE MARK

AIRCRAFT ARMAMENT

A bibliography giving references for research in this specialized field. Revised and brought up-to-date from the Aeronautical Index of the I.Ae.S. compiled with the cooperation of the Work Projects Administration. The references in this bibliography have been classified and cross-indexed under three main headings.

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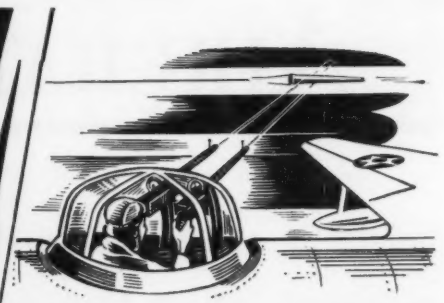

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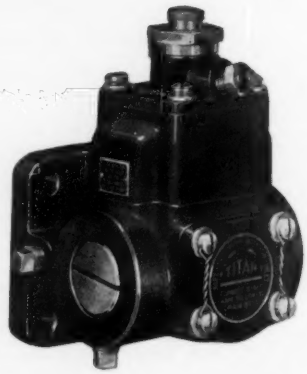

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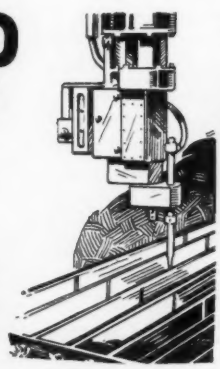

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  Division, Borg-Warner Company
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Sperry Gyroscope Company
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Standard Oil Company (Indiana)
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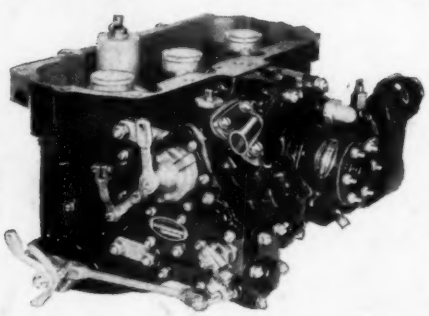

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